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HARDWARE

BUYERS GUIDE

CONTENTS

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The Commodore 64

Is this the computer of the decade?

Art Gallery

Some hardware needs great software to get the most from the system

Printer Buyers' Guide

Which features do you really need?

A Change Of Pace

The lowdown on upgrading your 803 printer. And calling

Facing Up To Peripherals

A look at the range of interfaces and their special features

Precision Printing

Perceptron proves that four heads are better than one

Printer Preview

Seven popular printers under scrutiny

Machine Mania

A Who's Who of Commodore computers

On Mice & Pads

The alternatives to keyboard control

A La Carte

The cartridge revolution has arrived

4 Features And Fittings

What can you give the computer but? who has everything?

8

14

19

20

24

26

28

32

34

36

40

42

44

46

48

50

52

54

56

58

60

62

64

66

68

70

72

74

76

78

80

82

84

86

88

90

92

94

96

Heavy Metal Hardware	53
540 has a good voice but MIDI means more music	
Life In The Fast Lane	58
A new DOS can make your disk drive really motor	
On-line Line-up	62
Choose a modem to broaden your horizons	
Fresh Chips	67
Getting close to descendants on the 801 printer	
Net Benefits	68
What do the networks offer modern users?	
Interfacing With The RS232	72
A do it yourself interface for the Commodore 64	
Talking Through Your RS232	82
Off the peg interfaces from Mark Electronics Research	
RS232 On The Plus 4	84
No need to watch the shops, make your own	
Commodore - Past And Present	98
Who is Commodore? CBM profiled	
Rad Boxes	92
Let your computer do the working	
Spanner In The Works	94
What can you do with a dead computer?	
Contacts	96
Addresses for your file of facts	



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The Commodore

Few computers can approach the success that the C64 has enjoyed. Why has it remained so successful for so long?

by Norman Doyle

The Commodore 64 is the flagship of CEM and has maintained a high profile in the market since it was first launched in August 1982. Despite its better sales performance, of the Sinclair Spectrum (now under Amstrad's wing) the C64 is a far superior machine with a 40 columns, 16 colour display (previous text eight sprites and probably the best sound chip in any home computer).

Really I should refer to the C64 by the name of its latest incarnation, the 64C, because the production line in Germany has been turned over to the production of this handsome reworking. However, the C64 by any other name, still sounds as sweet.

In the early days most of the programs written for the C64 were upgrades from earlier VIC II programs. With the passage of time, more and more programmers took to the home computer graphics designers have gone to town with animation of facts and a new breed of virtuoso has appeared to transform the worst chip into a work, simulation, art, music, and a high class environment the rest. For the most part the net result is that games look better, less artificial, in their presentation and they have had a knock out effect to various software.

What do the programmers play with?

There are essentially four modes of operation for the screen display:

Normal text mode

This is the power approach, which only allows three colours to be used simultaneously. The screen comprises 40 columns by 24 rows giving a total of 960 character squares on the screen. Each character square comprises of eight by eight pixel matrix and all characters can be modified.

The three colours are, border, background and foreground (sprites). All screen colours can be used on one screen but each character square can only exhibit two of these colours, background and foreground.

Multicolour text mode

A few chips possess the character square can exhibit a total of four colours, including the background colour. This is subject to the same and simultaneous conditions, what you gain in colour you lose in horizontal resolution. Each multicolour character square is limited by a matrix of four by eight pixels.

Once again the character set is modifiable and the mode

has been heavily exploited by games programmers.

Hi-res mode

This is the Commodore's graphics mode giving a screen resolution of 320 by 200 pixels. This is similar to the normal text mode, and uses the same four character positions allowing its two pixels to be drawn.

Hi-res multicolour mode

Once again this mode gives a black and white screen, the horizontal resolution is halved to 160 pixels.

In addition to these modes there is the standard text mode, which splits the character set into groups, which can have differently coloured backgrounds. Because of the subsequent reduction to only 40 characters on the set, it limits what can effectively be done, but some nice effects can result.

In addition to these displays there is provision for a maximum of eight sprites to be displayed at the same time. Each sprite can be modified to normal or multicolour mode, independently of one another and totally free from the screen mode selection.

The advantage of sprites is that they don't have a transparent background colour. This gives them an appearance as though they were painted on a transparent sheet and anything they pass



64



can be used to go through the speaker system in the system, or that this can be used to pick up bits of the system and use an alternative form to print, screen.

For the benefit of programmers the system can be located in any part of the 64K memory. This means that two or more systems can be used at once to allow complex programs by switching from one to another in quick succession.

The system limitation can also be overcome by a split program memory using split address techniques.

Sound Technology

The audio capabilities of the 64 are provided by the 64K channel 100. This device chip which gives three independent sound channels. With each channel you get full 4096 sample depth and a choice of three waveforms or a white noise plus limited ring modulation filtering and resonance.

This means that this a great harmony can easily be achieved but can be programmed to make this sound like a small group. The sound from a well programmed 64 can be as busy as others is for music and sound.

Peripherals chosen for the 64 and its variants can vary

cable to a wide assortment of printer interfaces, cartridges, modems, disk drives and a host of other add-ons. Ranged along the back from left to right you'll find a cartridge socket, TV output, composite monitor socket, serial port, cassette interface, and an RS232C-type user port. These are supplemented by two ports for joysticks, paddles, graphics pads, light pens, track balls, or mouse (mouse?).

Internally the whole juggling act is held together by a 640K microprocessor which is essentially a modified 6802. When it is not engaged directly through a machine code program it is driven by the Basic ROM containing the bootstrap loading to system Basic V2.

After much had been said about the 64K RAM it came, as a great disappointment and source of confusion to early buyers when the power up screen displayed only 10K of Basic RAM. Far from being a common ailment that there is 64K of RAM all of which is available to the user but at the cost of the full operating system.

Part of the memory are worked by the 64K chips in a page/track system which means that access can only be gained to the system RAM by bank selection. This has been exploited to the full by commercial machine code programmers, vastly improving the quality of software.

The real Achilles' heel of the system is the Basic, implementation which is ancient and contains no direct commands for sound or graphics control. The bad news is that this, unlike sophisticated programming a page but the good news is that all the PEEKs and POKEs form a good introduction to machine coding and there are not so many Basic languages and structures to master.

The apocryphal story of Commodore is that Commodore wanted a fully comprehensive implementation but it didn't see the light of day. Instead we got Simon's Basic, in the form of a player's cartridge, at a time when David Smith was only 16 years old when he devised the program with its 104 system commands and despite the disadvantages of a comprehensive Basic, it didn't really set the 64K world on fire.

Other companies have produced add-on Basics and the apparent weakness of the 64 can be turned into a strength because the machine can be converted into a dedicated computer with the correct handling routines.

Another area of criticism has centered around the slow operation of loading and disk loading. This has been done in software modification to overcome the difficulties of the loading system and users often wonder why the operating system didn't do this in the first place. This is an interesting question. Commodore claims that the slow load is more reliable and it certainly does appear to have a higher success rate than most fast loaders. The second and more plausible reason is that Commodore just didn't realize what could be achieved.

On the outside the machine doesn't seem to have changed as all praise to the 64C redesign but internal changes have been going on all of the time and the latest version of the computer board is the sixteenth yet.

In computer history there has never been a machine to rival the Commodore 64 in popularity, price and style. If this model does not see its twentieth birthday I'll hang up my pen and sigh for good.

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Abstract The purpose of this study was to determine the effect of a 12-week, low-intensity, low-impact, and low-volume exercise program on the physical fitness of sedentary, middle-aged women. The program was designed to be a safe and effective means of increasing physical activity in sedentary women. The program consisted of three sessions per week, each lasting 30 minutes. The sessions included a warm-up, a low-impact aerobic exercise routine, and a cool-down. The program was evaluated using a variety of physical fitness measures, including heart rate, blood pressure, and body composition. The results of the study showed that the program had a positive effect on physical fitness, with significant improvements in heart rate, blood pressure, and body composition. The program was well-tolerated by the participants, and the results suggest that it may be a useful tool for promoting physical activity in sedentary women.

Art Gallery

Mouse, pens and joysticks are useless without the software to drive them

by Norman Doyle

It is difficult to know how to start choosing a graphics package. The range seems overwhelming. The starting point should be the hardware you offer but, though some people know what they want from a graphics package, few people know what they really need.

For the best results the package should use the work as close as possible to the supported mode. Although this does impose a ceiling on the horizontal resolution, the benefits gained in colour and screen that highly polished results can be achieved.

A pixel (picture) unit is the smallest element of building blocks from which the image is created and the resolution is the number of pixels which make up the total image. The rule is therefore, the greater the number of pixels, the higher the resolution.

On a normal screen there is a matrix measuring 40 columns by 20 lines. Each matrix square contains a block, which is eight pixels square, giving a screen size of 320 pixels wide by 200 pixels high. This degree of resolution would permit a highly detailed image to be produced but features, especially imposed by the system means that colour use is strictly limited. Using the middle colour mode, permits all the colours to be used but reduces the horizontal resolution from 320 to 160 pixels.

Another imposed problem is that without flexibility is imposed by the limits of only having three ink colours (black, red and green), 4-bit pixels.

A good graphics package will have an on screen menu so that you can always see your picture when selecting the next drawing option. This may seem like a problem but a great part of the screen is obscured by the menu but most menus can be moved around the screen or even switched off to display the full image.

The main consideration is, of course, the contents of the menu. Facilities must be made for loading and saving images, too, changing printer parameters to tailor the output to suit the printer and interface that you are using, and an Undo system which erases your last action is better than having to rely on doing, for correcting mistakes, which may occur whilst you are completing a complex image. A full range of drawing options should allow freehand drawing and a wide range of shape creators such as circles, line drawing, polygons, arcs and shaped functions, and triangles, squares and tops are also useful. In addition, block size selection and colour fill are also essential and the ability to add text to the image can cure the problems of creating letters pixel by pixel.

Desirable though not absolutely essential are facilities for creating textures, patterns for the fill option, and for designing brush patterns. A Zoom option is also offered by some packages which is ideal for adding complex details. Zoom allows the selection of an area of the screen which is then blown up to show the pixels in greater detail. Apart from editing operations, this facility is essential if you are using a lightpen unless you

have a very steady hand?

Finally, there has to be a palette from which the brush colors can be selected.

Coolmaster

Trojan offers a two-lytapon with each of their three versions of this package for the C64, Plus4 and C16. It has a wide range of facilities allowing the user to draw lines and shapes which can be used as freehand lines, circles, triangles, etc. and has tools.

Taking into account special fill functions, active bounding and undo facilities, and the price of just £29.95 it would be reasonable to say that the highpoint is a free offer and that Trojan are offering a bargain to anyone who needs a quality graphics package that has no restrictions about using a lytapon.

The Image System

In the light of the ultimate graphics package, CMI, are offering a heavyweight package which they use to create many of the hi-res, leading screens featured in their games. The on screen menu display has a panel which displays a line up of the current working area to help with adding the low detail.

Where this package really scores is in the area of screen manipulation. Whilst the screen is being created, areas can be



moved, copied, taken up and down or scale rotated and even linked to create 3D effects.

The Advanced OCP Art Studio

Although the £34.95 price tag may seem a little high, this package is worth every penny. It contains facilities which would initially be associated with Elicore's Art's excellent Deluxe Paint graphics package for the Amiga, which is no mean trick on the C64.



It has all the expected facilities for creating images, including an excellent Zoom facility which allows the user to select the degree of enlargement. What really sets it apart is the ability to create and save picture elements, shapes which may be used and loaded for use in later projects.

The image can be created using either a joystick or a mouse. **Random Software** have also included the facility to display the finished image, despite the actual screen resolution picture so that you can see the macro effect of your master changes.



Blazing Paddles

This is the package which **Blaze** also has pointing and they will supply it with a matching highlighter if you wish (though it also supports graphics, tables, lines, and graphics).

The main menu is displayed around the first edge of the screen. From this, the many functions can be selected including a pattern fill and cut & paste. This last facility enables the loading of special pre-designed characters which are provided as part of the package. Animals, vehicles, various shapes and facial features can all be used to create pictures, making this a fun package for young children as well as adults.

Blazing Paddles costs £2.99 or £24.99 with the highlighter.

Cadpack

If you require an art program tailored towards technical drawings, table dimensions and scaling are of great importance then **Amicus Software** have the answer. **Cadpack** is an extremely flexible program which has 22 functions on the main menu, each leading to many further functions. Drawings, layouts and renderings are easily produced using the hot boarder a highlighter.

For the architect the ability to use other word devices and shapes should prove a boon. The scaling and dimensioning facilities are particularly impressive; as you would expect from a package costing £24.99 on the C64 or £34.99 on C88. The optional highlighter adds an extra £2.95 to the cost.

Artist 64

This package supports physical or mirror operation and has to be used to be believed. Although it is easy to operate, the permutations and combinations of functions seem almost limitless. Admittedly it is one of the more expensive packages available, market but it is also a highly polished vehicle for the artist.

Wigmore are justifiably proud of their art package which is impossible to describe in the limited space available here. To give you a taste of the range, images can be copied to any area of the screen, scaled through various colours, magnified, drawn from a fixed focus with a brush of your own choosing and design, screen filled, flipped, mirrored, rotated, may be partially cleared and so the list goes on and on.

Ultrabasic 64

Along with its sister program, **Ultrabasic 64**, this shows a different approach to graphics on the Commodore. In a BASIC like language but **Amicus Software**'s form of BASIC graphics is far faster and can easily be linked in to Basic programs. Apart from permitting the use of its own graphics, there are also limited screen controls and a sprite designed.

3D Graphics Drawing Board

No another approach to graphics art is provided by **Blazing Paddles**. As the name suggests this produces images which can be rotated and turned this way and that to give a true 3D feel.

The images are wire frame graphics produced from three basic shapes, a cube, a sphere and a cylinder. From these you

shape other shapes can be created in a building sphere. When the finished object is rotated, you can opt for showing or hiding hidden lines for clarity.

As an introduction to Computer Aided Design principles, this is an ideal package at a relatively low cost. £24.99.

Videom 64

The arrival of the Image System designed **CRL** - earlier graphics pack - **Videom 64**. The strength of which was the highest price of only £4.99. If **CRL** have any left at it your dealer has, buy it immediately!

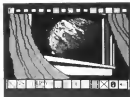
The package allows two modes of operation, multi colour or standard bit map. With multicolour you get the halving of the horizontal resolution but up to four colours within a character area. In standard bit map mode the horizontal resolution is high but the character ranges are limited to only two colours.

As the successor to the Image System, **Videom** has many advanced features such as pattern fill, area copying and a variety of other selected screen areas.

The problem will not be using this program if your graphics designer, it will be finding a copy that hasn't been swapped up yet.

Picasso's Revenge

This is the program which accompanies **Picasso's** highlighter. It is an intense, workable program which gives you all the tools you need but doesn't go overboard on special facilities. For the beginner this approach means that getting the full benefit from a highlighter driven program will not mean hours of reading and experimentation before you are able to tackle your first major artwork.



Drawing To A Close

If I was asked to place my hand on my heart and recommend the best computer graphics program, I think it would easily be **Wigmore's Artist 64**. Apart from a great art program, you also get little touches like being able to record your movements so that you can replay the creation of your image at a later date.



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[illegible]

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The cover of the 1997 Christmas Catalog features a dark, textured background with a subtle pattern. At the top, the text "1997 CHRISTMAS CATALOG" is written in a small, serif font. Below this, the words "HOLIDAY EDITION" are prominently displayed in a large, bold, serif font. The overall design is elegant and festive.

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A Printer Buyer's Guide

Buying a printer immerses the novice in a sea of jargon. Here's your first swimming lesson!

by Jon Wigler

A printer can cost more than your computer and yet most people still think of them as the minor part of a system. Far from just being a platter and a print head, the modern printer is an intelligent device which can offer a range of options to the user. Not all machines offer the same facilities, and the pitfalls are numerous.

Prices

You'll usually be able to buy printers at lower prices than the "recommended retail prices" quoted by the manufacturer. Work on the assumption that the best printers will be available for at least 10% below their RRP's and the oldest, run-out-of-run at 20% lower. Shop around for the best discounts you can get and remember that RRP's include VAT but not the cost of the data cables and plugs.

Warranty

Most models offer a 12-month warranty (Canon give two years). You'd be advised to get a written statement from the dealer underwriting your rights even if it's just a scribbled note on the

back of your receipt.

If you opt for mail-order, which is often cheaper, check who pays the carriage costs, if the printer fails, and has to be sent for repair. It will probably be your responsibility and makes buying easier home a better prospect.

Speeds

Many suppliers have criticised my printer speed tests, which show print speeds to be far lower than the manufacturers claim. So why not run your own test on the printer you plan to buy? Set it running on a slab of test some 5000 characters long, and then time it with a watch. Remember to terminate the test timing when the printer actually finishes rather than when the computer finishes outputting characters. This is because most printers now have memory buffers which drastically reduce the time that the computer is occupied but mask the actual speed.

When you're finished you'll have a far better idea of how long the machine will take to print the kind of things you're likely to write. The manufacturers' figures usually tell you how quickly the machine will print a straight line of spaces, a singularly useless and deceptive piece of information in my opinion.

STAN ML=10 Print out Partials, Residuals

Picture used before from David Huxley

Consider
Consider
Consider

Additional pitches available
under programme control

[illegible]21. Print *Pythagoras* and 14. Print *Newton*

Fig. 1. Effect of the concentration of the solution on the rate of the reaction.

5488 • J. Neurosci., July 26, 2006 • 26(30):5483–5492

An input buffer is RAM memory built into the printer itself to temporarily store incoming characters from the computer. This effectively speeds up printing because the computer can output characters far faster than the printer can print them. Using a buffer as a collecting pen means that the computer can spew out its information at high speed while the printer works at its own rate. This releases the computer from primary output line work quickly and the user can move onto other things while the printer chugs along at its own speed.

Millions of antennas becoming so common and so large (often with an open area only that by taking account of their present speeds would appear very microscopic. A document of 3000 or 5000 characters is frequently written two or four times to print out on a 24-character per second display unit. With a half of three or five lines per line, the transfer is comparatively instantaneous and you can read all that time on almost every terminal. So, if your main concern is to find a printer that doesn't let your computer up for a long period, look for one that combines high-speed output with a large input memory buffer or has a buffer as a separate unit.

How Many Protons Does

Different printers, apart from the very expensive ones, are *dot-matrix* or *daisy-wheel* types. Dot-matrix is based on a system of pins and hammers. The pins form usually just a single vertical line of nine pins, but sometimes it is a rectangle containing more. Each pin is hit by a hammer causing it to drive the ribbon and produce a single dot on the paper. A single pin may be knocked on or off many times to make any character. For example, the top pin may be hit five times to make the cross-bar of an 'H'.

In theory the more pain in the head, the better the quality of the print. 34-pin printers are becoming more common but normally cost over £500. Which one for price, ease, though, as there are no moving parts the follow-on cost of laser toner is

Interfases and Compatibility

Printers come with one of two kinds of connection to the computer: serial and parallel. A parallel interface means that the right bits (binary signals) needed to make one bit (single character) travel side by side down eight strands of a ribbon cable. This means that the computer receives data byte by byte, whereas, the slower serial interface sends data bit by bit down the same wire in bursts of eight, making rather like a computer mouse as the primary unit. It is easy to see that this means that the parallel interface can be eight times as much faster as the serial component.

Emergency care or other is offered as standard and the other is an option for which you will have to pay extra. Some prayers have Latinized interfaces. *Book 100*

Some printers work on the coding system adopted by IBM. However, most dot-matrix printers are Epson-compatible. This compatibility is limited now because it was based on the Epson FX and MX series printers, both of which have now been discontinued.

These models couldn't do near-letter-quality (NLSQ) type set printed manufacturers have chosen their own paths to select this mode. Through a linked line the Epson standard was being adopted at one time, at a high cost the computer industry set up a new standard between themselves.

To be on the safe side, select a connector with a wider, fixed

elite (improved) and NLQ typewriters and buy a wordprocessor which will allow parameters to be set up to achieve them.

Extra Character Sets

In many machines, the print font for memory spaces can be used to hold different sets of characters rather than those for other languages, such as the extended French alphabet or user-defined sets. These are often called downloadable characters and are particularly important for those users who need to print non-mathematical and scientific equations and symbols. Check how many different language character sets each prospective machine has and, if you need to use one in particular on a regular basis, check that all the required characters are there.

Controls and Software

A control panel should have switches for mains on/off, group on/off and for bold and line feeds. Form feeds are used with standard paper when you wish to set the print head at the top of the next sheet of paper and line feeds only advance the paper one line at a time.

As more printing modes become available the manufacturers have realised that many users and some wordprocessors cannot cope with so many useless controls. In the past some of these functions were selectable through the use of banks of four, eight or ten DIP switches. These are used to permanently set the printer on particular modes such as NLQ, into linefeed or to select specific character sets and so on. The only switches have never been popular, frequently requiring the dismantling of part of the printer before they can be delicately manipulated with the point of a ballpoint pen.

A prospective buyer should consider how easily the DIP switches can be changed. Because customers often arrive when the current switch configuration is not fully suited to the circumstances. Sometimes the paper which you normally feed through the machine is not available, for example, and a flick of a switch is preferable to negotiating your word processor or sending out control codes every time you want to print something out.

The latest breed of printers now include front control panels which allow the user to select special modes. Normally these are reserved for the range of typelaces currently available and their use often requires the pressing of various combinations of switches to be pressed and it may prove not to be as user friendly as you'd thought.

Fonts, Faces, Modes and Pitches

The increasing complexity of printers, and the rising use of desktop publishing systems has meant that the jargon used by printers is being used by a wider range of people. Terms such as fonts, faces, faces and modes are thrown around fast and fast enough to make a novice's head spin.

A font is a family of letter shapes (fixed printers often refer to this as a family). They need to be familiar names such as Helvetica, Baskerville, Pica and Times.

Within each font you can have variations on the theme

known as faces. Face is short for typeface and printer users soon become familiar with terms such as slab, (sometimes called oblique), Roman, bold or double strike.

Within each face you can get further variations known as modes. In principle these are specifically called condensed, expanded, subscript and superscript and all of these can be combined to give dazzling descriptions such as 'expanded italic superscript'.

Condensed type is very handy if you're trying to squeeze an as much type as possible into a small space such as a label or a table of data. This mode shortens the letter horizontally while maintaining the same height as though the letter was breaking in. Expanded type is the opposite of condensed and delivers letters which are stretched out horizontally but maintain the standard height.

Pitch is a measure of the number of characters per inch (cpi). Many laser and ink jet printers offer a variety of pitches on all font but dot matrix and daisy-wheel machines normally have a specific pitch for a particular font though you do occasionally get up to three different pitches for the standard roman characters.

Pitches are given names like pica and elite. Even this standard pitch typically offers 60 cpi whereas the narrower elite pitch has 12 cpi.

Fonts and faces are increasing in number as printers and emulators become more sophisticated. A typical page produced on a fine 60-10 printer is shown at Fig. 2.

More Modes

Extra modes, which may be available to the user include NLQ bold, emphasised and double strike. These are all variations on the standard dotly dash mode and describe the way that the dots are arranged on the paper.

Emphasised and bold are two names for the same effect. After the normal dash character has been printed, the head moves a tiny bit to the right and prints again so that the horizontal lines of the character consist of two sets of dots which, though forming an almost solid line, and the vertical components of the letters are double thickness.

Double strike (on the other hand) is when the printer head prints a dash character and then the head moves fractionally down and reprints the character. This means that the horizontal lines are twice as thick but still dotly and the vertical lines are also reprinted.

NLQ or high density characters are produced in a similar way but the second dot positions are more accurately placed so that the line is continuous. On some printers NLQ is a combination of double strike and emphasised. In NLQ mode italic and bold may not be available.

Facing Up To It All

In such a jargon what do you need on the control panel and what should be left as software controlled?

In general you need NLQ, condensed and expanded characters along with other typelaces such as Pica, Courier or Letter Outline. This is because once they have been selected they

will not be changed for the rest of the document. Italics, bold, upper- and lower-case, are user effects, and are how turned on and off when needed through software controls.

Proportional spacing is also desirable as a point switch. Most printers support this facility, which takes up the bulk of a document by leaving up the spaces between thin letters such as *e*, *i*, and *l*, and the neighbouring letters.

There should also be a form feed and a linefeed button to help align paper and an off-line toggle to tell the printer to stop clearing the internal buffer.

Light Relief

All printers should have LEDs (those small coloured lights) to indicate that they are plugged in and turned on, that they are also on line and to indicate when the paper supply has run out (though an on-line signal is just as useful). Extra lights to indicate the mode of printing are also desirable.

Handfed or tractor feed paper is pulled or pushed through the printer by a tractor which is a strip on each side of the paper where sprockets fit into the rear—off hole strips down each side of the paper. Sheet paper is fed through by being gripped between the platen and a roller in the same way as on a typewriter.

Just as you can't feed sheet paper through the tractor drive it is undesirable to try to feed handfed paper through on tractor drive. As the printer continues the sheet comes pull, from the weight of paper being drawn off the stack, will cause the paper to wander out of alignment.

When buying a printer make sure that the cost includes a tractor feed mechanism. Some models only supply them as optional extras. Also check your paper carefully because some handfed paper has faulty or unperforated edges. Unless you wish to keep the perforations attached check the quality before buying.

Many machines offer optional cut-short loaders but the cheaper ones never work very well. If you anticipate using a lot of handfed paper for business letters then stick on a sheet loader demonstration before you buy.

Ribbon Replacements

Most ribbons come in cassette form and either travel with the head or stretch the full width of the paper and allow the head to pass back and forth. There's no difference in performance but the former stretching type are easier to load without getting your fingers black.

In both cases loading a new ribbon is a fairly fraught task. With most printers you simply place the cassette in place and the advancing knob and the ribbon falls into place on the head between the hammer face and the paper—shield which prevents ink from washing off the ribbon and smudging the text.

Some printers use multi-stroke carbon ribbon which is a compromise between the old ink-impregnated cloth strip type (the a few which gave ribbons their name) and the single stroke ribbons which are acetate based and produce total transfer of the ink onto the paper giving sharp-edged dot-matrix prints.

Print Quality

The most important criterion is the appearance of the final product, particularly the standard of the NLQ mode: the characters not according to your present needs but against what you may require in the coming years. Are the letters pleasing to the eye, clean edged and unambiguous? Do the descenders of the 'y', 'g', 'q' and 'z' truly descend? Owners of older Commodore printers will appreciate how difficult and cheap these letters can appear without true descenders. Normally there is room for a descender to drop three dots below the horizontal line but some printer manufacturers only use two and reserve the bottom line for underlining. This should be avoided because with only two dots you sacrifice the loop on 'y', 'g' and 'z'. It always looks better if you get a printer which only underlines the letters without descenders, a broken line looks better than a confused mess. If you're not sure how the characters are formed ask to look at the manual. Somewhere in the appendices there is usually an exploded diagram of all the letters which the printer can produce.

The true measure of a good NLQ mode is to ask yourself if it looks like a daisy-wheel or typewriter print or just a less-dirty version of draft mode.

If you anticipate doing business correspondence, check that the printer has this facility and maintain the quality.

The Right Stuff

One way to check how well a printer is made is by its weight. Lightness often means stamped weight-saving and the use of plastic where metal would have been better. Watch out for thin plastic mechanisms because they will be the first parts to go when you carelessly drop a book or a pencil on the printer.

Check that the print head has a metal—laminated sturdy headstock attached. The movement of the hammer's steel contact with the pins and the pins contact with the ribbon all depend on energy on heat. If the headstock is inefficient you may be able to print all the cows come home in January but when summer comes round the printer will probably keep stalling up. You cannot test the headstock effectively but you can examine them carefully.

Another way of measuring the quality of a machine lies in the design of the switches. I divide these into switch-fabric, fabric and a snap of plastic type. I much prefer to hear a pleasant click indicating that the switch has operated.

The overall finish is important, too. By this I mean the quality and permanence of printed labels on the switches whether the switches are plastic mouldings, has been turned and a general feeling that care has been taken to create a quality product. My own pet hate in this department are firms which gladly part you from £100 but are too tight-minded to put a 50 pence spare plug on for you!

How's your MLRF?

MLRF stands for mean life between failures or how long, on average, the machine will operate without breaking down. If this value is expressed at all it's difficult to judge its significance.

because there are two methods of measuring MLPIB: the number of lines printed, and the number of lines printed.

As a rough guide I would calculate that since most printers operate at around 600 characters per second which equates to 45 lines per minute or 2,700 lines per hour. So multiplying an hourly MLPIB by 2,700 will be a rough guide but not really a satisfactory guide.

Just to add to the confusion, some manufacturers specify the life of the print head as millions of characters. Frankly, I'd be surprised if the Oki Microline, which quotes two hundred million characters, is not twice better than the German made Mannesmann Tally NT-40 which only claims 50 million.

One thing about MLPIB however it is measured, is that you can not claim MLPIB if your printer fails after six months, and you have no resort to the small claims court under the 'Trade Descriptions Act'.

Decibel Level

This is important if you end up doing the books late one night and the kids are asleep next door, or if your trying to listen to someone on a long distance call with the printer rattling away on the next desk.

It is extremely hard to find any kind of acoustic packing inside a printer. Surprisingly really when you consider that any way of eliminating the noise of a machine is by enclosing how many closed doors have to be in it the way before I can hear it? Try something like this, for example, can you hear it from outside the shop?

Ease of Use

Most of the time a printer with loaded paper looped through will just sit on the table and it will perform flawlessly. There will come a time when you run out of paper and have to lace upon new batch. Logic states that a good printer is one that doesn't call upon the skills of a welder or the ability of a computer to achieve the European state of lace-up.

Printers such as the Star NL-10 and Panasonic KX-P6010 have a nice feature whereby the printer will help the process of inserting the load sheet with a large number of a few lines.

One day some wretched little piece of paper is going to get lodged inside the printer. If this is going to involve working to a screwdriver and pliers or a crescent bit is not going to do you or your printer much good. Always find out how easily the covers can be removed so that the paper path can be laid bare.

Buying a Daisywheel

These printers work by spinning the daisywheel so that the point with the relevant character is rotated into position. A small hammer then presses the point onto the ribbon and the character is thereby printed onto the paper. The range of characters and the style of the font and quality of print is therefore determined by the size and type of daisywheel employed. Some wheels have more points than others but, before making your purchase of

A good manual should be AS easy as possible to lay open on the desk and should have stiff covers.

The contents page should have long and detailed descriptions of the chapter contents, and each subheading should have a page reference.

There should be a substantial index at the back referring to all contents and their codes and indicating where the DTP switch definitions can be found.

Before buying in at the shop and the principles of sending escape codes should be explained clearly.

There should be a summary appendix giving all the generic escape code options.

A list of all optional items should be given, including alternative or recommended interfaces, etc.

A full specification of the machine detailing all of the features, for explanation of ASCII codes, decimal and hexadecimal numbers should be supplied.

A separate or insert quick reference card should be supplied.

Fig. 1. Optional post code on the line printer.

Fig. 2. The User Manual Cover.

a machine with a comprehensive wheel, check on the availability and range of extra wheels, a daisywheel is plastic and wears badly.

Most modern daisywheels are Quiet or Double compatible which means that they adopt the same codes as one of them to achieve special effects. Most will print bold by double striking or shadow by often double striking.

Daisy Stream

Unlike dot matrix printers, the quality of a daisywheel printer is always excellent and this is why the daisy wheel, but relatively cheap daisywheel printer has resisted the advances in NLQ dot matrix, laser, ink jet and other printing methods.

Manual Labour

The quality of the handbook is, even if as important as the quality of the machine. What's the point of owning a Rolly-Rolly if you can't get it out of the package?

Figure 3 lays out some rules for buyers, and for the handbook writer. I particularly recommend that you check whether explanations are based without being patronising. It also suggest that you make sure that all the printers numerous control codes are detailed and, preferably, summarised.

Forty pages of explanation are totally useless if the writer has forgotten to explain that sending a Control code does not mean pressing the CTRL key? Disgrace, example prompts, and programs are all an indication of quality and clarity. You'll be lucky if you find an index in any printer manual but if you do it's probably a cut above other manuals.

A test out-sheet which can be kept under the printer is useful for a quick reference course on little-used codes. Otherwise you could be left thumbing through an un-indexed book for hours on end.

A Change of Face

If MPS803 printers are not the prettiest sight you've seen, Printkit IV could be the cosmetic surgery you've been looking for.

by Gordon Hamilton

Your MPS803 printer may be fine for dumping off listings and the like, but it's not going to impress your bank manager too much when you use it to write that greeting letter to him. To be perfectly blunt, the typeface looks awful. The lack of true descenders renders the print difficult to read, you keep wondering why a number "9" seems to be printed every time there ought to be a letter "g".

Enter Printkit IV from Acorn Printer Technology. Not only does it give you proper descenders, but also other features such as italics and bold typefaces and underlining.

The package contains two integrated circuits and two sockets, a resistor, a switch and some solder and glue. As the name suggests, it comes in kit form and you must fit it for yourself. To do this you'll need to strip the printer down, remove the printed circuit board, fit the components and then reassemble everything. Tools required include a small soldering iron, wire cutters and a couple of screwdrivers. The whole job could take you a couple of hours.

The instructions included are clear and fully explanatory. Your attention is drawn to the tricky parts and hints and tips are given to help you. The accompanying diagrams are carefully clear and large.

If you don't feel happy about approaching this job yourself, then you can send your printer to APT who will do the conversion for you for a fee of £15.

Once the kit is fitted, you are ready to try out the new facilities available to you. Naturally, the descenders are shorter, there are still no special commands for underlining, italics and boldface are switched on and off via special control codes. When using word processors,

you'll find that most of them will allow you to use these commands in your text. Included examples show the three most popular word processors for the C64, Superscript, Manuscript and Textanddit. Bold is effected by a double strike which does not slow the printer down in any way. The descenders make the most obvious difference to your text and, if you intend to send out a lot of letters, the package is worth having for that alone.

This italic script looks a bit disgusting, as if someone has just taken the ordinary text and stretched it across. Because of this, it is probably best only to print the odd word in italics, for emphasis rather than indicating whole chunks of text as a letter. It does give you five new characters though: left and right curly brackets, a divide sign, a copyright symbol and a right pointing arrow.

Bold can also be used for word emphasis but would be especially useful for those extra special letters to your bank manager though the extra work put on your printer ribbon by using this mode should be borne in mind.

Underlining is best used in conjunction with capital letters. Otherwise, it tends to run into the descenders that have been so lovingly created. Spaces can be underlined or not, depending on the effect you wish to create.

The switch allows the original printer mode to be recovered at any time, although the manufacturers are convinced that you will not want to do this very often except as a reminder of the bad old days!

These four additional features will certainly give you MPS803 a new lease of life, and at £30 has got to be a lot cheaper than buying a new printer!



Printkit IV is all his glory

Facing Up To Printers

Interface-phobia is a state of mind which affects many Commodore users. Broaden your horizons with our simple guide.

by Norman Doyle

Laving the easy world of Commodore printers for the tough world of interactive hardware can be a daunting prospect. Just buying a printer is not enough because the Commodore machines work through the serial port and most commercial printers have parallel (Centronics or RS232C) inputs. Many people forget to budget for an interface but without it control is not possible.

The mere mention of parameter setting is enough to cause panic to set in but interfaces are probably the least complex peripheral which you could own. A do it yourself interface is one option and not too difficult to implement if you understand machine code but the time that you have to load in software each time makes this awkward to use. The program uses up memory space and can prove impossible to implement if commercial software is being employed.

Centronics links are much more common than RS232C types and, despite the range of models, they all offer very much the same kind of functions. The conventional inwards integral interfaces supplied when the printer is purchased but many ports share in the cheaper and older ranges need an extra unit.

Most Centronics interfaces are actually serial converters housed in a box with typical measurements of around 180mm by 100mm. The few units that only have a ribbon cable and a serial DIN lead but also have a single connector for the cassette port. This is a power tip to supply the PCB in the interface with the correct voltage. Some interfaces tap their power from the printer's 24V line on pin 18 of its socket but because this is a standard pin used to check that your printer is of this type before buying such an interface.

As its simplest, a conversion interface simply collects, such as emanating from the serial port, assembles them back into a binary byte and sends this reconstructed information down a ribbon cable and into the printer as a parallel signal.

Although this is the prime purpose for the interface, there are always other benefits to be reported in each unit. As a typical example, I've chosen Precision Super-G interface.

Most interfaces, including Super-G, are supplied with integral DIN and ribbon cables which allow plenty of distance

between the printer and the computer. The power supply lead should terminate in a through connector which still allows the cassette deck to be connected at the same time as the interface.

The Outside...

The body of the unit sports a row of miniature switches which are always easily accessible and much easier to operate than the DIP switches used inside printers. These set the basic mode of the interface's interaction with the printer and these digits are the function of several of the normally inaccessible switches inside the printer.

The Super-G has a row of eight switches which are of a type which I've not seen before. Gone are the days of DIPs which can only be moved by the use of a strong ballpoint pen and a magnifying glass and these new switches can almost be flicked with a finger nail. It's only the close banking of the switches which prevents this ballpoint dream from becoming a reality. The positioning of the switches could be further improved by attaching them to the top of the PCB and cutting an access hole through the top of the unit. Instead, the Super-G has a suggested table of suggested switch settings for a wide range of machines, but the unit has no bar to be turned over to facilitate the setting of the desired arrangement.

The top panel could also be further improved by listing the functions of each switch. As an apparent afterthought, the manufacturer's, the Sage Corporation, has included a summary sheet inside the manual but a loose sheet can easily be lost.

The switches on the Super-G are fairly typical and control functions such as the supply of materials functions, setting the printer's device line on line and the selection of Commodore, EBCS printer emulation or transparent modes. The effect numbers represent the interface output mode to suit the printer to which it is connected.

It's the final category which is probably the most important of the switches. Commodore has its own form of character coding based on the ASCII standard. This has come to be known as

HITCH and causes problems when graphic characters are concerned. In addition, some of the standard printer commands for the Commodore system vary from the equivalent controls on other printers. Using the emulator/translator really allows you to use commercial software engineered for Commodore printers with any printer which is compatible with the interface.

A secondary benefit of the Commodore emulation is that most interfaces have a special "game" mode which substitutes the reverse field, graphic control symbols, and a PDSII statement into easily loadable interchanges or "CHR" codes. For the Super-G the reason that a reversed heart symbol indicating a clear screen command will appear as "CLR" is. Each interface has its own system of interchanges, so it would be fruitless to delve further into the Super-G than this.

Although it may seem strange, there is also a facility to prevent the use of codes which the printer is receiving instead of the actual characters. This is a function which is only appreciated on the rare occasions when it is used to debug an output routine which doesn't behave as expected or when a piece of commercial software produces strange results. With the flick of a switch you get a clear sequential printout of the raw code which may not solve your problem but does clarify the situation.

Daywheel printers are control led by a special serial configuration which sends a test only output.

...Inside

All of the remarkable features should be duplicated inside the interface operating system especially if the Super-G. The interface does not possess a reset button. This means that you don't have to fiddle about with switches if a special situation occurs where you wish to vary printer operations from the normal set-up.

These codes usually take the form of a secondary address in the open command, such as OPEN4,4,25. The problem with this system occurs when common real wordprocessors are used. The programs always open their own printer channel, and the addition of a special secondary command is rarely catered for.

A desirable feature of the Super-G is the ability to lock the interface so that it ignores any other secondary commands. Simply by opening a channel using one of the special secondary commands alters the interface (irreversibly unless the power is switched off). The wordprocessor can then be loaded without worrying about the interface's state being changed.

Why Worry?

Despite warning typical about the flexibility of interfaces, I have to confess that my own interface was set on the day that I bought it according to the manufacturer's recommended settings, and I haven't touched it since!

I've stressed that there is a wide variety of interfaces and the best way to buy one is through a local vendor who can set everything up for you initially. I've selected a few which I would personally recommend but manufacturers are almost always American and suppliers change so rapidly that it's not so easy to keep up to date.

Super-G

This is the most recent interface to come under my scrutiny and I am still very impressed with it. Precision are the suppliers, and the current cost is £14.95 placing it at the lower end of the price range.



I've already covered most of its facilities, but the one criticism I have is that the manual could be better organized. The inclusion of an index or a few appendices tabling the special features would help greatly.

Micrografix MW 350

This unit has an DIP switch situated in a recess on its upper surface, next to a reset switch and a panel which gives details of the switches, functions, and the current configurations for the major printer types.

One useful feature is the ability to print out a status report detailing the parameters with which the interface is currently operating. As a player you can set whether your interface is being governed by the interface and even which printer's configuration you currently set to. Most of a library that a facility, this could be useful with some non-standard software.

This interface is also suitable for daywheel printers and has emulated ECLP and graphic macrocontrol modes as well as transparent.

Two additional features make this an intelligent interface which makes the whole process of printing easier. Firstly, control codes can be sent to the printer even in emulation mode by providing the command with an extra CHR(47) control character. Secondly, and more importantly, there are a series of extra commands for setting page width, length, perforation skip and so on to make the printer print at the end of each page for single sheet feed. With an interface like this who needs a sophisticated printer?

Just before you start wondering why I mention any other interfaces when this one appears to set, store and make use at the same time, we come to the cost! The cheapest price I've seen is £40 as a sale "discount" at a price.



Device One

The Device One interface is another one at the top end of the price range but it's the extra facilities which make it really excellent value for money.

Device One is no slouch either—it has 64K of ROM and 64K of RAM*. This enables extra facilities such as font internal character fonts, font compressing, plus the ability to print pictures, addresses and banners.

To accommodate access to these extra abilities there is a set of 32 commands, giving the printer another operation mode apart from emulate and transparent. Semi-transparent mode allows the interface commands to be executed even though the printer thinks it is operating in transparent mode.

Pictures can be sent down to the printer and printed out as half or full-size. You could combine this with addresses, printed

out by the interface or even as part of a banner. Banners are created by causing the printer to print lengthways, across the paper instead of across the width as larger than normal lettering.

With 64K of RAM available you also have an extensive printer buffer.

Software is provided with the interface which allows you to access the interface's facilities more easily and two font editing programs. One of the font editors even allows you to hunt through the computer's memory for a character set which may have been used in a game.

The Connection

The Connection is a lot simpler to use than most interfaces because it is printer specific, and has its own command set for controlling printer formats. There are only two DIP switches to worry about and even these are hidden underneath the label as though they weren't really necessary. If you just want to use your printer as a D52 then they aren't necessary for most applications.



One switch determines whether the interface is in transparent or emulation mode and the other determines the function of the second switch. This switch determines whether a halfsize is sent or not in transparent mode. In emulation mode it selects a secondary mode which is either 'extended' or 'limited'. Extended mode enables the interface to respond to secondary addresses and to use its own special commands. Limited mode disables the response so that software compatibility can be maintained.

The commands cover all the printer dimensions—allows for damping, and another which breaks up programs living long in variable points to improve readability.

A special command, the macro, is quite useful for it allows characters to be managed. For example, if you want to print <CLR> in place of CHR(40), you can do it through the macro command. This means that specially formatted listings can be made using mechanisms of your own choice.

BI Interface

I include this interface because no one that keeps turning up in various games. Batteries included are one of the firmest



Canadian hardware and software producers and their interfaces of theirs is constantly priced around \$30.

Last I heard, Amelink's were marketing this one last, by now it may be in someone else's hands. Whatever the case I have no doubt that on a busy shift it'll sit up and down the country there is a H. Interlink or two.

The functions offered are fairly basic and no special features are included but the interface is a reliable link for your printer and ideal for those who prefer the minimalist to the more.

Centronics Unseen

There are several interfaces I've yet to see but it's only fair to give them a mention.

Revsdan Microsystems have the **Exotic Supergraphix** interface for \$59.95. This sounds a little like Device 1 because it has a double-duty font and a large buffer.

Stack Computer Products' interface is compatible with the full range of Commodore computers and costs \$59.95. If you also want 8K of buffer space the price is \$69.00 but a Centronics cable which links the user port to the printer will only cost \$10.00.

An alternative approach to interfacing is provided by **Microscript** with their Centronics link and driver software for \$29.95.

Delta Pi Software have two interfaces: a basic one at a very low price of £29.95 and the **Super-G** at £34.95.

A very neat interface is available from **PCC Systems**. The electronics are contained in a small cartridge on the rear of the Centronics connector. This looks neat but could cause problems with some printers by blocking the paper feed. The PCC interface is priced at £39.99.

In addition to their £35.00 Centronics printer cable, **H&P Computers** also has extension cables which can further increase the distance between your computer and printer. A one metre cable costs £5.00 and a two metre cable is priced at £7.00.

The RS232C Alternative

Although Centronics links are the most common printer connection, there are several models which favour RS232C links. The advantage of an RS232C printer is that the interface can also be used for linking in a modem. The disadvantage is that the connection protocols are more complex than Centronics connections.

If you're a novice, you're strongly recommended to obtain a software disk that will help you to set up the parameters. In most cases a suitable program is supplied with the interface but always check before buying.

A specific disadvantage with RS232C connection on the C64 is that opening a channel automatically sets up a buffer at the top end of basic memory. Starting at around 96000, the position of the buffer can overwrite any variables that the rest of your program may be using. This is further affected when the channel is closed and the top of memory returned to its normal 64KFF position. Now any variables that were set up during the RS232C communications phase will be wiped out. It's rather like executing a CLR statement at the start and finish

of RS232C interchanges.

RS232C interfaces are not as rare as you might at first think. Most companies who sell Centronics interfaces also stock RS232C connections.



Brain Boxes and **York Electronics** both produce respectable RS232C packages but the **Brain Boxes** interface has switches on it to help permanently set up your interface. The YER one lacks any switches but has an excellent price of around software along with a port initialization program and a transparent printer driver.

The **Brain Boxes** package costs \$49.95 + VAT while YER systems will set you back by only £29.99.

Other companies producing interfaces are:

Delta Pi Software where interface and software retails at £37.48. **Stack Computer Products'** RS232C connector costs £33.00.

An intelligent RS232C interface is manufactured by **PCC Systems**. With its own processor and a massive 64K buffer high data transfer rates can be achieved and the computer is tied up for a little time as possible. The snag is that the system cost £19.00 but, for those who want a cheaper interface, PCC also have a low cost interface for £35.00.

The lowest cost interface is that produced by **H&P Computers**. With an **Amelink** control program the whole package costs only £25.00.

Keep Up To Date

The printer interface scene is changing and evolving all the time with more and more printers, including machine matched Centronics interfaces. There is often still a chance that an internal control system will enhance a printer's specifications in the way that Device 1 operates. As RAM chips continue to fall in price there may come a day when interface buffers will free computers as soon as a high speed download has been completed. The result for the user will be freedom from the time delays involved when waiting for the printer to do its stuff giving hours of uninterrupted word processing and programming.

Precision Printing

Are four heads better than one? Precision Software's Peripheral Printer sticks its neck out.

by Norman Doyle

The last thing that struck me about the Peripheral Printer was its beautiful streamlined appearance but when I looked inside I thought it was saying things I've never heard! Surely this is some kind of joke! After about six minutes of using it I was thinking how come nobody had thought of this before!

This is the most innovative and exciting peripheral that I've seen for a very long time. The technology of dot matrix printers has reached the maximum speed which a single head could produce, but this machine increases that potential fivefold. To say that I'm amazed would be an understatement!

My instant reaction, and even when faced with a printer such as this I am not the type of reviewer who will gush at high printout rates. My second reaction to the machine was to say that four heads mean four times the noise. I was wrong. Alright so it is a little noisier than many of its single-headed brethren but the benefits far outweigh this drawback.

Logically, this machine either uses four times the speed but also offers four times less meat on the heads, not documents. Added to which there are a few more innovative features which make this my peripheral of the decade!

In my article on printers we have laid on heavily on the deficiencies of the switch systems employed on printers, especially the widespread use of DIPs. Indeed this printer up its wazoo and there's not a DIP switch in sight. Instead a small cursor to the right of the printer head is connected to reveal twelve well spaced slider switches which even the clumsiest of fingers could operate with ease.

This bank provides all the usual functions that DIPs usually offer: Eject/Blank selection, linefeed, paper end detection, character set selection, line and form length and line spacing plus



new dashed/undashed mode. Curiously the twelfth switch serves no purpose.

In front of this switch bank are four very keys and four LEDs. Apart from the usual online, form feed and loaded buttons, there is an NMI button which overcomes the problem of selecting this mode through software control codes. The switches are rugged, positive controls, and the LEDs leave you in no doubt about the operating mode. Power, paper out and online are all indicated by their respective LEDs and the NMI light comes on when that mode is in operation.

Fast But Firm

The use of four heads means that the general architecture of the printer is not so rugged as conventional dot-matrix models, but four sets of matrices hammering against the platen at the same time. This solidity may have resulted in a hard-looking exterior but the sleek lines of the machine belie this possibility.

Enough of this cataloguing, let's take a look at the. The quadruple heads give this printer a print speed of a staggering 480 characters per second in draft mode and enables NLQ printing at a rate which beats some printers in draft mode. 80 cpi in NLQ is not to be sniffed at.

In bit-mapped graphics mode the screen dumping the printer performs in unimpressive mode which shows a clean white line at first it will heat every printer I've seen because having four heads ranged across the paper's width means that the carriage does not move, the heads move, thus about two inches.

Apart from NLQ and draft modes the printer also offers condensed and enlarged modes. This, in normal and enlarged (also super-and super-and double strike, condensed plus condense. In NLQ mode the three condensed double strike and super-and super-and modes cannot be used.

My only real complaint about this machine is the manual which is presented as a paperback (perfect bound) and liable

to split or shed pages as it is provided. The contents page is limited to general headings and the information is so unorganised that it is difficult to find the information that you need quickly. A full index at the back of the book would have helped immensely.

Interface Inclusion

As standard the Peripheral Printer has a Centronics interface fitted but this can be replaced with an RS232C module. For Centronics users the Centronics interface is recommended because Peripherals are offering an optional plug-in for Super-G interface module bonded with the printer.

In the article on interfaces I have already praised the Super-G for its ease of use and facilities so apart from understanding Peripherals' offer I will say no more here.

Conclusion

You may have guessed that I am bowled over by this product. In previous I smart looking NLQ displays that it's a pity that some of the draft features are inaccessable. As far as speed is concerned this is a beauty and shatters about the rest. If speed is a prime concern then this is the only printer for you.

brain boxes

Commodore 1500

C206/94 IEEE 488 interface £69.95
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Printers come in all shapes, sizes and decibel levels. We put sixteen different machines under the microscope

Jon Vagler



Picking the written word onto printer paper may seem like a fairly mundane task, but there are more makes of printer than there are types of computer. In fact, there are so many different printers available for your Commodore that it would take too many pages to describe them all.

I've listed my comments on some of the more popular machines that I've not included matrix, three-daisy-wheel and one thermal printer.

BROTHER M-1500

This printer is a beauty—a low, stylish, 112-column machine with many desirable features. Unlike many printers, the main, cable and data cable enter at the side, avoiding the danger of losing folded paper trays.

With a similar thought for accessibility, the power switch is situated on top of the printer and an array of maintenance switches permit typewriter standard NLQ, near-letter quality

selection and paper feed type—continuous, fan-fold paper, single sheet feeding or automatic sheet feeding using an optional cut-sheet feeder.

Ribbon changing can be a very messy process, but the Brother cartridges include a little plastic running guide attached to the ribbon which is easily clipped into position on the print head, leaving hands and fingers immaculately clean. Beneath this ribbon compartment are found the control clip switches. The switches have a plastic cover to protect them, which also bears upon it a description of each switch's function, a very useful feature.

All panels are removable so that the printer may be cleaned, but some of them proved could only be fixed with difficulty. The unusual tractor-drive mechanism for folded paper clips onto the back of the printer. This ensures easy loading of folded and cut-sheet paper as well as allowing easy removal of paper jams. The printed quality is excellent, a cheap NLQ typewriter with curves, dots, direct letters, in other words, the standard style, italic, bold or boldface italic. My only criticism is a personal dislike of the slight discontinuity on the line of the lower case 'n'.

The manual is neatly laid out and has excellent diagrams, but the contents list is brief and only occupies a single page with no index to support it. Despite this, unfriendly silencing system, all the

This is the STAR NL-10
This is NLQ mode
This is Italian
This is bold faced type
This is bold-faced Italian
This is underlining
Here are some descenders
YYYY PPPP QQQQ JJJJ

This is the CITIZEN 120-D
This is NLQ mode
This is Italian
This is bold faced type
This is bold-faced Italian
This is underlining
Here are some descenders
YYYY PPPP QQQQ JJJJ

necessary information seems to be contained alongside a Helvetica-like summary of all of the escape code commands. One slight blunder is the misnomer of a brief description of what each escape code achieves.

If disk space and bank account will allow for a wide platen machine, this is a highly recommended and excellent printer.

CITIZEN 120-D

Unfortunately the Citizen is not widely recommended. I was not impressed with this machine's noisy performance and the sub-standard appearance of the NLQ mode printout.

The compact, simple design of the machine is not helped by the ugly tractor-drive attachment. When the covers of the drive sprockets are open they also obstruct the opening of the top cover.

Sheet feeding proved hazardous too. When an tractor feed was the lower selected, the friction feed failed to grip standard weight paper securely enough when I tested this facility.

The overall finish is shabby, extremely thin metalwork and flimsy adequate plastic. The print head looks particularly flimsy and delicate and in my tests only achieved a speed of 87 characters per second instead of the specified 120 cps.

The variety control panel sports just three windows and three indicator lamps. The letter quality and some short hand functions on the panel seem to be shortcomings, hurriedly added to an existing panel.

The printer does have some good points including the simple selection of print face via the control panel.

correspondence draft quality, rather emphasized and reduced. There is also a replaceable interface cartridge to match the printer to the computer.

Most printers require an additional interface to match the Commodore or IBM286 sockets to the Commodore output ports, so allow for this when comparing the price of the Citizen against other makes.

Finally the handbook has a convenient list—and well showing all the necessary codes. My pet hate with this, and other manuals is the lack of an index but otherwise it is nicely produced.

EPSON LX-88

This has recently been replaced by the superior LX-800 which offers a similar upgrade to NLQ at 3K, instead

buffer and an user-defined symbol, which could even be used for personal logos. The greatest speed is slightly higher than the LX-88, as is the price of £275.

In the absence of hands-on experience with the LX-800 I can only conclude that only under LX-88 which should still be around for months to come.

In its day the LX-88 replaced the LX-80 as Epson's standard workhorse and included many enhancements lacking in its predecessor. The tractor unit became an easily removable device with tail width adjustment enabling the printing of address labels and pay-slips.

Unfortunately the positioning of the tractor feed spoils the attractiveness of the printer design and also obstructs the feed selection lever. This means that if loaded



paper has been loaded and the user then wishes to attach not a quick envelope, the tractor drive has to be removed to switch to friction feed and then replaced after the envelope has been completed.

The arrangement also has the effect of making the start-off strip more visible with the tractor feed fitted, just when it's needed most! The quality of performance, on letterfed paper is of varying effectiveness and a tear-off strip is often present and therefore desirable. Although Epson do specify that a tear-off lid is supplied with their roll paper feeder, for those lacking a separate cut sheet feeder is available as an extra.

Although my printer is only fitted with a standard parallel interface, Epson tell me that a whole series of interfaces are available including one for the Commodore serial port.

The speed claimed for the machine is 120 characters per second but my tests produced a slow and noisy 57cps. In addition, the NLQ mode does not permit italics and the appearance of the NLQ is not quite up to business correspondence requirements despite the crisp and clear appearance of the well-formed characters.

In standard mode, there is a choice of eight different typefaces, selectable from software codes on through a somewhat complex system using the control panel. Member of the printer modes supports proportional spacing.

BROTHER M-1109

This is a remote machine requiring only 10ft inches, making it ideal for those with limited desk space. Although Brother's penes are awarded for the inclusion of both serial and parallel interfaces as standard it immediately begs the question as to a correctly control panel.

Although NLQ mode can be selected from one of the two membrane switches on the panel there is no facility for choosing a form feed.

I often suspect that many printers have tractor feeds fitted as a design afterthought and the fitting of this unit leaves problems on the M-1109. Most of the problems result from the trade-off between compactness and convenience.

The tractor feed not only inhibits the



feed control switch but also negates the use of the tear-off strip in the plastic cover. Similarly the limited wheel which Brother have used in preference to a paper feed knob, is rendered difficult to use by the tractor feed attachment.

Apart from using the main plastic cover to cut down the noise, the user can also select a special quiet printing mode. This is not easily accessed through commercial products; for example, when planning to make half a dozen telephone calls while printing out a trial balance because it can only be controlled by software and few products allow for unique commands such as this.

The printer is extremely slow, clocking in at a speed 47cps against the claimed 88cps but it does have a good typeface.

The printer package is marred by an extremely poor manual containing only the briefest contents list but no index at all, no handy reference cards and no explanations of control codes. In addition the chapters relating to dip switch positions are extremely confusing.

STAR NL-40

I liked this machine immediately. It is extremely well made and robust with many delightful features.

The first main feature is that the tractor feed is built-in so that the

machine maintains a clean, low profile and all parts of the paper feed path are accessible in the event of a paper jam. An intriguing automatic loading sequence comes into play if the paper feed is not level or moved back so loading is held or cut sheet paper is extremely easy in this machine.

I also liked the ribbon carriage, which has a remarkable self-cleaning to keep ribbon cards clean and the generously large fonts attached to the plastic holder.

Another attractive feature is the shock-absorbent machine which is fitted with a single screw ensuring that steadiness and safety do not result in poor electrical connections.

Compared to many of the other printers on test the dials and buttons, holding covers in place, were all smart and secure and looked as if they would happily endure hard wear. It would have been better if the cartridge could have been fitted about half an inch nearer the output edge of the printer away from the paper track. For most applications the position can be selected by placing the leftmost speaker hand rest in the extreme left where the printer head will still reach the edge of the paper.

Also, all I liked the generous control panel with no less than seven indicator lights and five switches. From the panel the user can select NLQ bid

plus slide and condensed gratrices. Italics can also be achieved in both bold and NLQ modes.

Another panel feature is waste-feeding, moving the paper a fraction of a linefeed up or down. This is useful for printing complex mathematical and scientific formulas, or simply for placing the paper accurately before a point cut. There is also the facility to reset the left and right margins very handy for the occasional non-standard document.

The Star is a big machine measuring 18.1 inches but this space is well used for robustness and convenience. The only real complaint is with the rather curious policy in the instruction manuals (one for the printer and the other for the interface). However there is a fairly extensive prompt card printed on plastic-coated paper but it doesn't include a list of the various control codes.

With the prices now as low as £248 the Star NL-10 gives the best value of any of the machines covered here.

ONE MICROLINE—1802

The Microline-1802 is business-like in appearance: slimmer than and square with a very unobtrusive control panel.

The low profile is maintained even when double-feed paper is being used by moving the tractor sprockets on the

plates inside itself. Placed at either end of the spindles means that the user is not only limited to A4 folded, but that the loading of paper is also slightly thicker because the sprockets wheels cannot be adjusted independently. The manual does show an alternative more conventional tractor feed as an optional extra.

The ribbon carriage is robust and makes us suspect the veracity of its claimed capacity of three million characters (the Brother's carriage is twice as large and only claims half a million).

The interface socket is badly positioned so that the ribbon cable is guaranteed to interfere with the paper path and the streamlined shape of the printer is spoiled by a paper-thrust device which engages awkwardly in situ on top of the machine.

The Microline looks steadily made with thin plastic panels and a paper feed selection lever which looks particularly frail. On my sample the colour of the plastic cover didn't quite match that of the plinth (one of the plastic legs had already broken off, the connector on the back was upside down whether in error or by design I know not) and the mains cable has a right angle corner for which means the cable leaves the machine in an awkward sideways fashion. There was also an extremely fragile looking wire clip which functioned as a hold-out mechanism and the dip switches could only be reached with the

aid of a screwdriver.

The machine is strictly IBM compatible which means that many printer manual instructions would not be able to be Commanded printer emulation. Otherwise the facilities are so limited that the IBM codes are not precise too difficult to learn. The only lines are pica and elite in condensed double width or with underline and without italics. What is classed as an NLQ mode failed to improve with its poorly shaped characters and lack of true descenders on the 'g' and the 'y'.

The manual is very poor with only two colour printing and using Americanisms such as:

LFPRINT "Who you gonna call?"

Most importantly the index is inadequate covering such important headings as NLQ Dip Switches, Inter board under Switches, internal control board and Backlash board under Printing enhanced emphasized but with nothing under Enhanced or Emphasized.

All in all I was not impressed with this machine.

KAGA TAXAN KP800

The KP800 looks very similar to the Canon PW800 but considering its age it seems a little unexpected. It runs quietly apart from a clunk at the end of each page as once in feed and has full compatibility with 80-column code.

Despite the lack of an indicator mode it is nice to be able to select NLQ from the panel of switches on the front of the printer. NLQ does not support under- or bolding but there is a wide range of print modes and font giving variations in the print-out character set with attractively varied tails on the descenders.

For those willing to trade off speed for quietness, there is a special half-speed mode which will please the neighbours during a nocturnal printing session.

The manual has a very detailed contents list, excellent line diagrams and numerous tables detailing the various character sets and their dot patterns.

I didn't like the front switches on the control panel and found the platen would not pass paper thicker than an original with two carbon copies.

Despite my desires, opinion that this machine is not to be recommended. I'm





said I must disagree and say that I was thoroughly impressed with its overall performance.

SMITH CORONA D200

This model comes from an American company with a fine reputation for typewriters and printers largely produced in Japan. The D200 has been around for some time in this day and age that means more than a year¹ and they are difficult to find over here but worth hunting out.

At a significantly lower price than similar models, the D200 offers excellent NLQ with built-in justifiers. The print quality was very good but some of the lower case letters had flat tops and bottoms.

The printer has proper selection switches on the front panel and the dip switches are easily accessible at the back of the printer without having to unscrew anything. The actual interface is go-back and a master plug is supplied already fitted.

My only anxiety about this machine is the noise it makes. The feedback is particularly a worry and though this could indicate inadequate engineering it couldn't actually do anything wrong.

In most models the tractor sprockets are "pushers" but the Smith Corona tractor actually pull. With this system

essentially feeding paper backwards for re-alignment tends to result in a paper jam. I found that this could be overcome by switching over to friction feed when feeding the paper back then back to tractor feed for printing.

The overall finish of the printer is slightly marred by having a piece of acetate pushing crudely back into its frame necessary on double feed and very noisy.



I am particularly irritated by the handbook which, though apparently comprehensive by its thickness, actually contains a mere 33 pages of English text with the rest being foreign language representations of the same indecipherable material. The contents list is totally inadequate and descriptions are clumsy and most unhelpful.

The outcome is a printer whose good value-for-money rating is marred by a very poor manual.

Micro-Peripherals MP163

This machine is extremely small and compact but behaves as a very pleasant master.

Although I was pleased to note a switch and accompanying lamp for NLQ mode it seems a little unfortunate to include lamps for both Ready and On-Line.

One of the dip switch banks is located in a little slot at the back of the machine where it is easily accessible in a pencil but you need a good light or a person's talent to read what purpose each switch serves. Access to the other bank of switches can only be achieved by unscrewing the cover.

The machine was fairly quiet in particular the feedback made virtually no noise at all. Even the paper out signal plays a pleasant little tune rather than the



output speeds rivaled by most of the other printers.

The various hinged top covers are rather inconvenient and look a little fragile; however, they have the benefit of being totally removable in the event of a paper jam.

The paper-loading edge is attached to the front and the slat arm which swings up to hold the paper tightly against the platen just above the print heads. The slats do not have locking devices to hold them in place but rely on friction instead. Despite my apprehensions about this system, it seemed to work very well.

The printing quality was only fair, having no loops on the descenders, a box-like "e," and the bar on the capital "J" barely escapes from the carrier. Though the NLQ mode supported italics, it did not support boldface.

The manual is very good; if only it had an index at the back there it would be excellent. In particular it emphasizes the wide range of character widths and spaces that can be obtained.

The printer came less well packed than any of the other samples, so watch out for damage when you first receive it. The manual had a lock key, which bit with a non-adjustable limit. Its lock key always in reverse feed paper will void the warranty, according to the

manufacturer.

The MX80 is a good printer at a competitive price.

Canon PW3000A

This is a stripped up version of the Raga Tera NLQ KPR80. It purports to print at 144cps, rather than the KPR's 140cps, and to produce nearly carriage returns per

second, three more than the Raga Tera. NLQ can be selected by a front panel switch but, as every other respect, the two printers perform identically.

The model I tested suffered from the same defects as the KPR80: a distracting clunk at the end of each print line, lack of italics or boldface in NLQ mode (though you can buy a ROM which gives NLQ italic), absence of an NLQ indicator, and an assembly to take more than two cartrons.

Under test it also suffered several paper jams but I'm prepared to believe that these were my fault, rather than the printer.

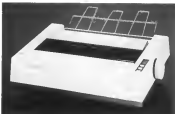
Printing quality was fair in post type, the "q" has a flattened loop on its descender whereas the "j" curves gracefully.

Mannesmann Tally 83

Testing this machine after all the Japanese printers was rather like driving a Volkswagen after a series of Ferraris: it felt solid and reliable.

The speed is measured by a large, adjustable buffer. In my test on a 5000 character test in NLQ mode, the computer was free for use in 58 seconds, but the printer shut down on for a further 302 seconds.

The printer head is very quiet, especially in NLQ mode and the control



panel with its four switches and associated indicator lamps is far more attractive than those on any of the other printers.

The top cover remains as rigidly in place as you access for loading paper jams or for general maintenance, but a hinge would solve the problem of where to leave it while work is in progress. The smoked-ribbed window makes it difficult to see what the printer is doing, and I feel that the temptation would be to leave the cover off all the time.

The tractor feed pulls the paper through the printer. This can be irritating when you have to feed a sheet of paper each time you feed folded paper through. It's advisable to back feed with friction feed on the uncomfortably strong tractor friction lever selector.

Two excellent features are the slot for interchangeable dot-matrix cartridges, a cartridge holder behind a hinged door on the front panel, and the software method of overriding the dot-matrix settings, thus avoiding the problems of manipulating inconveniently placed memory switches.

The dot-matrix are standard Epson-BM compatibility, line spacing from 10 to 18, zero symbol slash suppression, NLQ mode condensed face, perforation skip, linefeed on carriage return, and several international character sets.

The quality of printing is very high indeed. Boldface and italics are both available in NLQ mode. Lower case letters have properly shaped descenders, and the "i" has curved arms.

The two-part handbook is extremely good. The Operator's Manual has all the necessary information for using and maintaining the printer while the Applications Manual suggests ways in which your computer and printer can be used together.

Both booklets are well produced, decorated and filled with a wealth of notes and a tear-off printer card.

It's a fantastic machine. I first reviewed it in 1983 and was so impressed that I bought one. It has served me faithfully since then and was sold in new condition when I recently upgraded to a laser printer. A tribute to its reliability and reliability.

It may be feared but I enthusiastically recommend this printer to anyone who can afford its slightly higher price.



Panasonic KX-P1081

This is another superb value printer with which great care has been taken to achieve ease of use. Three different modes of operation can be controlled from the main panel: draft, NLQ and condensed.

The dot-matrix are ingeniously housed in a slot next to the base under the print head. It's a pity that the cover is just a cheap piece of corrugated plastic which the circuitry would get covered in

paper dust.

Loading up paper is usually a hazardous and irritating routine on most printers. Panasonic seems to have analysed this and it's as if an unseen hand grips the paper as it is fed into the printer and then guides it into position. With a similarly sympathetic attitude towards the task of maintenance of printer ownership, Panasonic's approach to filling a changing makes it an easy and relatively clean job to load or remove the cassette.

Unfortunately I'm not so keen on the

plains, covers, especially the clear plastic one which protects ink and its nozzles, and replace.

The print quality was generally good, especially in B&W mode, but the lower range p. lacks a little. My test rendered a speed of 184ips, compared to its stated 204ips, and this was achieved reasonably quickly.

Panasonic has produced a detailed handbook with a full index to cover most of the needed controls/paper. So no user has to take time to explain the use of control under on a detailed and easily understood way.

All these facilities, plus the relatively low price, makes the KX-10001 one of the best B&W units around.

Triumph Adler RD7020

Triumph Adler are part of the Volkswagen group, so just might guess just by looking at the construction of this daisy-wheel machine, it is well designed and gets eventually finished through construction is appearance and moderately priced.

It is also fairly slow, only registering 184ips in its own self test facility. On a word and speed test, a strong, and noticeable relationship consequently this is relatively quiet and pleasant sounding for a daisy-wheel printer.

With many a printer the whole



household and some of the neighbors are aware when it is in use but the RD7020 can be ignored somehow simply by closing the door to the room it is in, thus making a phone call while it is working in the same room would be possible and yet I still feel that the noise level could be reduced even further with the use of acoustic walling!

The word parts are particularly robust and all the electronics are protected within a sturdy screening metal box. This robustness appears to apply to all

areas of construction: the radiation switch under the main cover has a substantial length steel shield and another sturdy plate, lever up to the daisy-wheel from its spindle.

It was this daisy-wheel lever that led me into trouble. I accidentally released the daisy-wheel before accepting a printed and broke it as a result. Daisy-wheels are not inexpensive items and though I admit that the fault was my own, I think a little bit of shock-proofing would not go amiss.

The Triumph Adler daisy-wheel has a slightly larger diameter than the Qume and Diablo wheels that carry 800 characters per inch but rather than either of the others and come in two mechanical character sets.

The paper handling system is particularly elegant. A single lever operates the automatic feed, merely moving the feed arm out of the way at the same time and the tear-off edge, comes in perfectly better than any I have encountered.

A revolutionary design feature is the way that the data cable enters the printer through a grommet, like on the under-side. This arrangement obviously solves the problem of the cable bending the paper feed.

The front panel switches are properly connected and there are very convenient selector switches for page length, daisy-wheel type and print pitch.



The RD5020 has a lever which allows the selection of single or multi-strike ribbons. As well as a 60000 character carbon ribbon, the printer supports a 300000 character multi-strike carbon ribbon and a million character laser ribbon.

Points I didn't like about this machine are the paper advance knob and the ribbon selection lever. The manual paper advance knob is spring-loaded and has to be pulled upwards before it will engage. I found this particularly awkward and it seems to be an unnecessary refinement. On the other hand, the ribbon transport selector is essential but the symbol panel which indicates the mode that has been selected is obscured by the casing housing the electronics.

I only have a draft copy of the manual and there appears to be a considerable contents list, plenty of explanations of control codes and abbreviations, but (naturally) no codes, and no indication of the availability of any alternatives.

Quint Letterpro 20P

The thing that impressed me most about this printer was that it was the only one that performed up to my specifications when subjected to my speed test.

The Letterpro is constructed to a high standard with a robust aluminium die-cast lower body and no less than 600 different die-cast parts available.

My projected against mechanical switches was debated by the type included on the main panel of this machine. They have an extremely positive feel with a neat appearance and the provision of a reverse feed which was particularly welcome. Not everyone will like the awkward way in which the reverse feed works which, at least, there is a reverse drive facility.

When the switch is pressed once it advances the paper by an eighth of a line. The advance by a full line, which must be pressed eight times. This should not be the case because the paper ought to advance by a line at a time simply by holding the switch down. It does, actually, do this but after a short delay to allow for lagging fingers on a short advance the paper shoots through at a surprising rate. With quick reflexes an operator



would learn to anticipate the pause but I feel most people will do what I did by resorting to the manual feed knob.

Letterpro does not take too kindly to carbon copies, with the great money-switch set at its middle value it could only produce one carbon copy of variable quality.

Despite this, the paper handling systems are the best features of this machine. The tractor feed and cut-sheet feeder are cleverly designed to be removed and replaced in seconds but it is the paper feed mechanism which really excels.

The tractor feed is truly eccentric and holds the paper just as securely as the way in as it does on the way back out again. Freedom from the worries of paper jams, which are normally caused by attempting to run the paper back and forth through the printer, is an open up new, creative possibility. Text can be printed in several columns to give an appearance similar to those magazine pages, by printing the first column several lines leading, printing the next column by tabbing past the first and so on until the page is filled.

The manual warned me of few problems. It states that the printer is bi-directional but monitor when I did the test would pass across the paper on a printing pass and perform a carriage return back to the left margin. A

bi-directional printer actually prints out the next line as it travels back to the left margin. Speed tests revealed that the printer was close enough to its specification of 20cps for me to assume that it is not a bi-directional machine.

Further investigation revealed that the printer on my table didn't quite match the printer in the manual. These differences were slight such as the ten-punch dip switch was in reality only eight-punched and the advance bar mentioned in the manual did not appear on the machine.

The Letterpro printer is extremely well made and this reflects the years of experience which Quint have gained. Perhaps it's also this economy which accounts for the lack of any truly revolutionary features. Despite this it has to be said that if you want a really make, reliable machine with top flight paper handling capabilities, the Letterpro 20P is the obvious choice.

June 6200

This interesting unit appeared to me immediately because it was so easy to set up for review and was the quietest of the printers on trial. In tests it performed very close to its claimed specifications achieving a speed of 27 cps and comfortably took A3 land did paper with almost no set to space. Even taking the



large manual feed knob into any slot, the width of the machine is still only 6 1/2 inches but the lack of an automatic paper loading system makes using up A4 (and A3) a tedious task.

The device has one of the other usual parts, back rollers but the plastic used wears rather than considering the width of the machine. The back of the cover has several thin plastic lips which I think would break off very early on the printer's life.

The ribbon and Dapple-compatible typewheel are extremely quick and easy to fit and the cables all emerge from the side of the machine, well away from the tangle of paper trails.

The manual is informative and surprisingly entertaining. Apart from the detailed instructions and explanations, there's a section on the history of printing and typing. It was in this section that I was amazed to find a small sketch dated 1840 showing a typist using an electric

dotting machine!

The size, colour and simplicity of this machine shows why it has proved so popular in office environments but for home use its price is a disadvantage.

Okimate 20

This is a thermal printer which can take a three colour ribbon for special applications. Although thermal paper is not essential for this printer it can be used for monochrome, pinpoints and could prove to be more economical as we shall see.

Any thermal printer has a print head which contains 24 tiny heating elements that press against the paper or ribbon. If thermal paper is used, the localized heat from each pin discolours the paper but, on general paper ribbons work by depositing a small amount of a waxy substance from their surface when touched by a hot pin to form the matrix

dot-pattern for each character.

Ribbons can be blank but the Okimate allows the use of a tri-colour ribbon which gives limited colour printing capabilities. The ribbon cassette looks a little like an audio cassette and the colour ribbon is divided into alternating lengths of red, yellow and blue sections, each group of three being divided by a clear plastic section. Each colour segment is about 25cm long (10 inches) and the printer whistles the ribbon back and forth at an alarming rate.

This system has three side-effects. Firstly the printer works very slowly indeed. Secondly all this ribbon movement increases the likelihood of a ribbon breaking and finally the ribbon is consumed at an alarming rate. If a colour ribbon is used in monochrome mode, this will obviously no need up at three times the rate of a monochrome ribbon. With ribbons loaded at such the cost paper becomes a serious consideration.

Does it work? Rather surprisingly, it does but paper selection is critical. The feed mechanism doesn't handle thicker paper happily and for the cheapest image with a high-gloss paper should be used.

The printer can handle expanded condensed and split prints as well as undermag, supermag and valuetype. There is also a NLQ mode as well as the

used draft mode.

The main drawbacks with this machine is the appalling paper feed system, lousy design and construction. The very poor instructions in the manual compound these failings and the net result is a frustrating time with the miserable paper jams. Because the paper has to be so thin it is difficult to load and I've found

that this machine works best.

The printer could not be seriously considered for frequent use but it does have the potential for providing a lot of fun for those with a pseudo-artistic desire to experiment with colour printing.

The price of £175 or less hardly reflects the poor quality of construction of this machine.

The Verdict

MACHINE	TYPE	PRICE (£)	COMMENT
Apple IIe-1600	ML	225	No NLQ mode - handbook particularly poor
Apple IIe-1600	ML	495	Excellent CPU-colour printer
Ciura P400001	ML	349	More limited no NLQ software
Ciura 4500	ML	263	Poor NLQ image display
Epson LX-85 800	ML	275	No function feed with selected drive feed
Jeti 8200	DL	520	All feed speed expensive
King-Tony 82001	ML	319	Canon 8000's clone
Matrixwriter Ltd's ML-85	ML	380	Reliability and quality at a price
Matrixwriter Ltd's MP601	ML		Compact pleasant but quiet
Okimate III	DL	191	High memory value can produce excellent program outputs
Okii Microdot-102	ML	260	Reverses like IBM standard only poor manual
Pentium 85-1600	ML	240	Good value, easy to use, poor construction
Qume 4.44000-200	DL	450	Reliable well made but not fast
Smith-Corona 8200	ML	280	Long track record, good value, poor manual
Star NL-80	ML	240	Robust made ranging features, none
Teraprint Alpha 7810010	DL	175	All feed feature, good value for money

Conclusion

The Star NL-80 is a superb product at a very reasonable price. It is usually associated with an excellent paper feed, it prints very well-ranging and accurate, including high resolution and high resolution. No NLQ mode, however,

although internally available from good manuals and an excellent though not standard manual. It is also, at least in terms of value, very good.

In the old days, I hope, all printers were well constructed and the Star NL-80 is no exception. The Teraprint Alpha 7810010 is the more common

Machine Mania

To the layman, the range of Commodore machines in the shops can be confusing. What are they and what can they do?

by Norman Doyle

At the moment Commodore have quite a range of computers available. You can still buy the Plus4 and the C16 at bargain prices, some of the mid-range C128s are still around, but by far the greatest numbers are in the C128D 64K and Amiga models.

Commodore's marketing philosophy for the C16 and Plus4 is not easy to understand. When everyone else was dithering about upward compatibility, Commodore decided to go their own way.

Commodore can't have been too happy with the range of quality which greeted their new machines. The main problem was not the quality of the machines, in many ways they are excellent, but that they lacked any compatibility with the highly successful C64. In the Plus4 had been a C64 with advanced Base, and integral Commodore business programs, with as it does a C64 provided as the C16, then the addition of the C128 would have given Commodore a range, without parallel, in fact, I believe that Commodore could have dominated the home market at its expense of Amstrad and Sinclair. Unfortunately, this was not to be.

Despite this apparent error of judgement, the sales of C16s and Plus4s has resulted in the development of quite a healthy user base. This phenomenon is due to heavy discounting and both machines have subsequently enjoyed a relatively long and healthy lifespan.

Commodore 16

Based around the 7001 chip, the C16 has 16K of RAM, though

only 12K is available for Basic programming. The memory is expandable to 64K to enable it to take a Plus4 without the on-board firmware business programs. Commodore did have plans to produce an expansion RAM pack, but it didn't get into production and much praise is due to Amiga who have been successfully selling their own C16 expansion cartridge.

The version of the C16 increases 40 columns to 25 rows in text mode, 128x200 pixels in hi-res and 640x200 pixels in multi-colour hi-res mode. Additionally, there are two extra split screen hi-res modes which halves the bottom two lines of text.



mode. All these modes are addressable through the superb, extended Basic commands.

There are no sprays in the computer's graphics armory which means that games often display striking problems unless the moving characters are multiples of the basic eight pixel square. If a character doesn't fit the full square, overlap onto the background results in the colour of the moving graphic matching the colour of the background.

Colour capability generally is far superior to the C64. Apart from black, each of the remaining 15 colours can be displayed in one of eight lines, or horizontal. This permits the use of subtle shading effects.

The C64 looks very like the C65 or VIC64 and you cannot tell the IO ports: they all look different from the C64 apart from the video and serial ports. The use of miniature DIN sockets for joystick and cassette linkups has caused problems because of the nonavailability of these plugs and the delicate nature of the very thin connection pins.

The cartridge port is also different from that of the C64 but for three reasons, a very good reason. If anyone was foolishly enough to try connecting a C64 cartridge to the C65, the result would be an apparent malfunction because of the differing internal memory architecture of the two machines.

By far the greatest strength of the machine lies in its extended Basic Version 3.5. This adds about 50 new keywords to the original Basic which Commodore had tried to force the early PET machines.

Through the new commands, graphics and sound registers can be addressed more easily, the loop structure is more sophisticated and error trapping is at last possible. The built-in machine code monitor is also an asset. Having been plagued by the lack of a C64 internal monitor, this is a feature which elicits my envy.

The C65 has been a much misunderstood machine standing in the shadow of the C64. It is still a bargain today at under £100 but the few software buyers who have persevered with C65 computers are now doing as more and more of the users become disenchanted with the lack of charm of the machine.

Plus4

Everything I've said about the C65 is true for the Plus4. In addition to all these virtues, the Plus4 has 64K of RAM in which a massive 80K is available for Basic programs. Given that the new Basic ROM means more structured and less wretched programs than with previous versions of Basic, the machine becomes awesome in its programming potential.

In appearance, you could be forgiven for not making the close links with its little sister machine: the two computers bear less resemblance than the C65 does to the C64. Although Commodore intended the Plus4 to come businessmen's appeal, to my eyes it looks cheap and nasty and belies its real strengths.

An extra port is available on the rear of the machine. This is the standard RS232 type of connector which also appears on the C64. Through this port parallel communications are possible and an adaptor will turn this into a suitable RS-232 link for use with a modem.

The Plus4 got its name because of the four in-built

programs contained on special ROMs. These contain a wordprocessor, database, a spreadsheet and a business planer's program.

There are two schools of thought on this subject. If the programs suit your needs, this is the best machine you could ever wish to own. If the programs fail to satisfy you then they may as well not be there.

Another striking fact is that the Plus4 is generally supplied with a cassette recorder but the application software is geared up solely for disk use! This means that buyers of the Plus4 also have to fork out an extra £100 for a disk drive, or fiddle about with the internal monitor to accept tape. I often ask myself why Commodore didn't allow dual operation of tape and disk but always come up with a vague answer.

The wordprocessor allows a maximum line width of 77 characters. My first reaction was to ridicule the fact that this was decided upon despite most printers (Commodore's included) have 80 characters to a line. However, I then realised that it always set a left and right margin of five characters' width, so 77 characters is, after all, quite reasonable.

Once all the text has been entered for a document, special commands allow lines to be inserted or deleted, the movement of blocks of text around the document, set the page length and the number of lines which will appear on that page, and has a function which enables the user to search for a specified word and change it when necessary.

Other commands allow you to set tabulation points, centre lines of text on the page automatically, right justify a document and to load, save or even merge another file onto the text in memory.

The database allows each record to contain a maximum of 17 fields (pieces of information) with a maximum of 30 characters per field. The maximum number of individual records in a single database is restricted to 999 but this can be less if all of your fields are used with the maximum number of characters.

Once your database has been set up, there are several commands at your disposal to help you to sift through the information. One of the normal functions of a database is to sort the information into alphabetical or numerical order and this can be done on the Plus4. The main requirement, however, is



the need to be able to extract information. To this end, there are Search and Review facilities. Review simply flips a number of records sequentially onto the screen, starting from a specified record number. When a desired record is found that function can easily be aborted. Search allows you to find a specified record by allowing you to specify a string of characters, such as a friend's name—and the computer will pull the file, from the file and display it onto the screen. The database also allows the user to print out a report file which only contains selected data from each record.

The spreadsheet is a fixed format type, having a matrix measuring 17 columns by 50 rows. This gives 850 cells, but only a three by twelve block of cells can be viewed at a time. The cells can be assigned complex formulas which automatically calculate its contents according to the contents of other cells specified by the equation.

The graphics program is more an extension of the spreadsheet than a stand alone module. It is very disappointing allowing only bar and point graphs. It would have seemed reasonable to have expected a pie chart with the graphics capabilities of the machine. Commodore's excuse is that it maintains compatibility with all printers but surely those owners of at least dot matrix or daisy-wheel printers would soon learn that some of the graphs were unprintable and that owners of good dot matrix machines would have benefited from extra flexibility. Commodore decided that it was better to preserve all with this homogeneously democratic facility.

Owners of C64s with disk drives can benefit from buying a Plus4 at today's low prices. For less than the cost of four applications programs they can buy the Plus4 as a dedicated business machine, sharing the C64's drive. For others, it is not such a bargain unless you're willing to cough up for a disk drive and printer. You'd probably be better off with a C128.

Commodore 128

The C128 brought Commodore back onto the right track for system development. Upward compatibility does not mean that you can't run a totally different line, and change the architecture about to suit the new regime. You simply include the old machine inside the new one, and upgraders will still be able to use their old software until the new programs can be allocated. There is CPM as well and you've got a multi-million seller.

Well it was a nice theory but it faltered because of the structure of software houses in speculation on the 128 side of the machine, or deference to the guaranteed sales of C64 products. If the houses had been willing to convert to the C128 by producing software today to make profits tomorrow, then the sales could have been all that Commodore had envisaged. The C128 is the best thing—but that Commodore have produced. It has relatively fast disk access and stacks of memory to play with. The VTO Bus is an improvement on version 3.5 and the RGB has been more the best Commodore picture you've ever seen.

What shattered the software houses confidence? Commodore should have more readily put their money where their mouth was both for the 128 and the CPM modes. Investing capital to get selected, reputable companies to produce a reasonable software base would have shown their confidence in

the machine's success more effectively. A range of standard and proprietary CPM business programs could also have assured the success of the small business. Instantly giving beyond word to the sales drive. Commodore must break their arrogant attitude that all they need do is produce the machine and then the software world will support it. Who wants to buy a machine that has no software, who wants to develop software for a machine with a small user base?

The original C128 did not last for long before the C128D appeared. With 128K of memory to C128, few users have a laptop that will compare its size that is a 2000 machine takes to load a suitably large program? The C128D with its clever separate keyboard and integral disk drive is a machine that should have been launched originally.

Little has been said about the C128D in the computer press, and yet it is such a superb machine. Admittedly the 80400 system split can be a pain but I've known worse situations.

The keyboard is very professional looking and quite comfortable to use. Backing is done as far as the numerical keypad and, once you get used to their new position, the function keys are easily reached. This layout did initially cause problems with games using keyboard controls, but now that software houses take this into account, life isn't so bad.

The disk drive is a D71 double-sided drive which means better value for money where disk storage is concerned. Although this proves faster around 17 times faster than the old D41 when you are using the machine in C128 mode the breakers are applied and it's back to relying on software turbo systems.

The C128 could have an important role as a business. All of the test in this magazine was processed on one and the editor loves his C128D dearly. The software base is there but you have to look for it, perhaps another price cut would breathe new life into the machine.



Ampex

The Ampex Commodore new flagships aren't their first Easy models, 386-bit machines that it's certainly their best. With the A200, A2000, and, while stocks last, the A3000, there's plenty of choice. The A2000 at its current price, at around £500, has well been criticized as being too expensive compared to the Atari 500 but let's face it, it beats that machine, by light years, and a higher price doesn't stop the BBC Micro from gaining a fair proportion of the eight-bit market with less to commend it.

The features of the Ampex are almost legendary: 128K RAM, the Bitter high speed data transfer chip, 128x256 up to 640x480 pixel resolutions more than a laptop word-processor, built-in 8.2-megabyte cartridge, a seven second chip of awesome capabilities, integral 1.5-inch disk drive, the list could go on forever!

When you consider the A2000, the true power of the machine becomes obvious. With 512K RAM standard but expandable virtually to 2Mb, multitracking capabilities, and the new Bridgeboard system. Although the Bridgeboard appeared to have a few glitches in the original A2000 Commodore now claims to have cured this and I am waiting with bated breath to see if full IBM XT level compatibility is possible. As the Ampex launch cynically suggested, producers are so hard to pump when the Ampex was shown running Macintosh's MS-DOS graphics programs, Deluxe Paint in Amiga mode and the Amiga demo programs all at the same time!

Time will tell if the Ampex is a winner, it should be but Commodore have had so many winners in the past that hard to tell before the winning post. It all depends on marketing but Commodore seem to be gaining the lead which has always been their original plan.



Of Mice and Pens

Computer graphics can produce stunning results, but the artist often needs a help in hand.

Norman Doyle

The difference between conventional art and computer graphics is that the musician and the medium no longer come into contact. Instead, a remote-control device of some kind must be employed. This can take the form of the keyboard, a joystick, a mouse, lightpen or graphics tablet.

For most people, the first graphics tool will be the keyboard, or a joystick used in conjunction with one of the many graphics programs, which are currently available.

Using the keyboard is probably the hardest way in which to create a picture. The use of cursor keys is simple, but straight horizontal or vertical lines, but diagonals and arcs are almost impossible to create accurately on keyboard mode.

Although most art packages have special facilities for drawing such shapes, there will come a time when the design calls for a spiral or a specific, parabola which cannot be created in anything other than freehand mode.

Working Sticks

Even if they wish to enter peripherals, most computer users have a joystick in their collection and this must, singularly be the most common tool used in graphics.

The selection of a joystick is one of personal choice. I am currently using a *Quickshot Turbo* which is ideal for graphics because of its integral fire button on the ergonomically designed handle. *Speedmaster's* design team also had the foresight to include rubber markers on the base of the unit. This means that I can anchor it firmly to my desk, leaving one hand free to manipulate the keyboard-aided mode of my graphics package. If £62.99 isn't too far for *Quickshot* is too much for your budget, then is a less expensive version, the *Quickshot M*, for just £17.99 (R199 £16) which also sports a similar feel.

The way a joystick program operates is to check the value of memory location \$61204 (DC00) for Control Port 1 or \$6123 (DC14) for Port 2. These locations correspond to two bytes on the ADOS 6526 complex interface adapter (CIA). The joystick's control plug chosen actually uses all nine pins of the socket because only six are required (one for each button that generates a one for the fire button and an earth common which grounds the pins which is currently switched to on by the joystick's movement).

Inside the CIA, the movement of the stick can be detected by reading the lower four bits of register \$6A20, the fifth bit being the fire button detector.

Direction	Value
North	1
South	2
West	4
East	8
Northeast	9
Southeast	10
Southwest	6
Northwest	5
Fire	16

The easiest way to read the joystick from Basic is through the WAIT command using the form WAIT a,b,c. Port Control Port 1 the value of a is 145 and for Port 2 its value is 146.

To test for a direction the values of b and c are both the same. So to test for an upward movement on a joystick at Port A, a sample program would be:

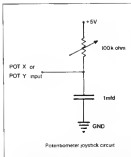
```
10 PRINT "CLR MOVE JOYSTICK"
20 WAIT 145,146:REM CLEAR THE PORT
30 WAIT 145,146
40 PRINT JOYSTICK UP
```

Although sampling of the joystick port is possible from Basic, a truly reliable program is best created using an interrupt routine as machine code is now the Control Port's status. This means that the program is tested every time a second which is much faster than any subroutines call in Basic could ever be.

Greater Potential

Just as a joystick is many times better than keyboard control on a point-to-point joystick is better than the normal switched joystick. The reason for the greater control lies in the way it is connected to the computer.

The Control Ports have nine pins, we know that six of these are used by the standard joystick but there are just six of pins which give access to a special facility known as A/D, or analogue to digital conversion.



An analog signal is one which continuously varies, a digital one varies in finite steps. The potentiometer joystick makes an analog signal through a variable resistor (potentiometer) which probably allows most of its voltage to pass as it is rotated rather like a volume control knob, and decreases when

Manages on the system can be broken down into two components, vertical and horizontal. Accordingly the joystick contains two potentiometers, approximately linked at 90 degrees to one another so that the amount of stick movement in any direction indicates rotational movement of the potentiometer, which reflects the degree of the two components of the movement. The wipers, and therefore the voltage through each, over a range from zero to five volts.

A single byte can store any whole value from 0 to 255 but with no decimal places. The voltage must therefore be made to trigger the byte to jump one value as every 20 millivolts change is detected. This analogue to digital conversion is achieved by a special section of the SID chip. The values recorded for the horizontal and vertical components can then be used to pinpoint a specific position on the screen.

The actual accuracy for the control is shown in Figure 1 but remember that there are not identical counts in each axis. There is only one count through pass X (vertical component) and 4 (horizontal component) on the Control Ports. The pass and memory chip connected to the SID chip is usually 54257 and 54258 and their values should be 128 when the stick is in its central rest position.

A mouse works on the same principle but resembles a mechanical control upped down with two buttons placed on the top surface. These two buttons give, plus the fact that it runs about



the table with a long tail of connecting cable trailing behind, control the unit is easier. More can be easily controlled by one hand and like the other hand for operating the keyboard. Many people seem to dislike mice when they first use them but after a while they find these delightful little creatures have become totally indispensable.

Light Works

Working without using a lightpen is very like working a traditional artist at work. The sheer image of passing the hi-touch wand over the screen and, seeing an object is impossible to draw this. Apart from anything else, how does the computer know where to make the mark?

Lightpens pinpoint their position through pins, pins similar to those employed by the potentiometer joystick, and the mouse but each location is derived by a totally different method using vision.

A TV picture is created by a stream of electrons being focused across the screen in a regular pattern at 625 lines to make a scan. The screen is treated with a special coating which emits light according to the strength of the beam of electrons which hits the screen and back, closely enough for it to maintain a reasonable output until the next scan. If a sensor is placed in front of a point on the screen it can detect the moment that the scan passes by.

A lightpen contains one such sensor and, because the scan is controlled by the computer, the position of the pen can be accurately located by polling this memory location which keeps track of the beam when the horizontal and vertical placement of the pen can be calculated.

This is the theory but the practice is a little less accurate, then it could be because of the way in which the VIC chip operates. The Y-axis (the vertical position) is measured in two parts of accuracy but on the X-axis this is reduced to four parts. What this means is that you don't get pinpoint accuracy with a lightpen and software has to compensate for this with Zoom facilities and the like.



The components for the screen position can be read from location 40287 (X components) and 50288 (Y components). Obviously accuracy will further be affected if these locations are read from flash because of the time delay involved in reading the two locations.

To help software programmers, a switch or trigger of some kind is also included on the pen so that software can be informed at the exact moment when a point is to be plotted. This trigger is connected through the same pin which is used for the joystick. For buttons see Control Port A only.

The Plot Thickens

Probably the most available peripheral is a graphics tablet like the famed **Acadia Pad**. This is another way that computer art can approach the traditional pen and paper approach. Simply by moving one's finger with a stylus, a faithful reproduction can be produced on the screen.

The pad is conventional with a pressure-sensitive matrix covered by a rugged but yielding surface. Ideally there would be a connector at each point location but once again the limitations of the computer's electronics inhibit such point-point activity.

Access to the output of the pad is achieved through the same pins used by the mouse.

Shoppers' Guide

Several computer products stores for the Commodore and anyone buying the special 64C pack will find the **Acadia mouse** and its accompanying **Direct** software inside the box. Those who wish to buy the **Acadia** package will find it widely available, but anyone having problems can buy the mouse and software from **Stick Computer Products** for £29.95 on cassette or £29.95 on disk. Their own **Stick Mouse** may seem a little expensive at £15.00 but it has three trigger buttons and an X-Y axis lock for greater control.

The **ADM Mouse** from Advanced Memory Systems also features three buttons and the package costs £19.95.

Wigmore's product the **LightPen Mouse** for £69.95 which includes their **Arise** disk cassette software. Disk owners will have to fork out an extra £2.50 for the floppy. The mouse has a special function of the computer is powered up while holding down one of the two mouse buttons it can be used like a single-directional switched joystick.

With a price tag of £24.99, the **Droid Mouse** may seem the most economical of the three—bizarre more but it doesn't have any software support included in the price.

The first lightpen I ever saw was the **Stick Lightpen**. It's around today and still costs only £29.95 which can't be bad especially when you consider that you get a graphics package and two games.

Biggs's lightpen is another old wrapper with a great reputation. Rather than sell a graphics package as a backup to the lightpen, this is a lightpen which backs up the Commodore software. There's more good news because the C64 version costs exactly the same as the C64 one, £9.95, which by any standards is excellent value.

Another package offering a free lightpen is **Blazing Pixels**. Even **Droid Blazing Pixels** is an expensive software package and at £24.99 with a lightpen it is a bargain which is hard to find.

When it comes to pressure-sensitive graphics pads, the range becomes extremely limited. The **Acadia Pad** has not been available over here for some time but may occasionally turn up in second-hand stores and should be snapped up immediately. Beyond this, I know of no other pads specifically designed for the Commodore market.

With pressure-sensitive pads the method is not so black but can hardly be described as easy. **Stick Computer Products** sell its **Arise Analogous Joystick** for only £19.95 and many of the Japanese MSX standard joysticks, some produced with pressure-sensitive mats but they likely would need modifying to suit the Commodore market. It's best to stick to the Japanese manufacturers' products such as **Tekisha**, **Powerman**, **JRC** because all of the British-made joysticks are standard switch-operated types.

Missing Feature

Whatever you decide to buy for your graphics pad, there's no getting away from the fact that you'll have to buy a graphics package to supply the initial on-screen environment. If you're going for the more expensive such as a lightpen then go for a fully inclusive package of pen and software. If you don't like the software in the package, you can always buy a suitable package later on.

Whatever your final decision may be, there is an extra facility which you'll need that isn't supplied in any of the software menus I've seen listed.

A La Cart

It's taken five years but the cartridge revolution is here. Now the only problem is to find the one tailored to your needs.

by Tony Hetherington

The Commodore 64 is a class of its own when it comes to utility cartridges. The BBC has its ROM chips but the C64 owner need only plug in a cartridge, to speed up disk access, add a range of useful utility commands, create a screen dump, freeze a game to create a cheat version or, in my case, take a separate screenshot and dump programs from tape or disk onto another disk or tape. It's a compact item allowing you to pack more games on one disk.

Some cartridges contain routines to backup commercial software which should only be used for personal use. I accept the right of an individual to backup his own games and convert them from tape to disk instead of paying again for a disk version of the same game; but I must condemn any attempt to use these devices for software piracy.

Many note the software feature of its ports, and the programmer's design and graphics, and of their regular use as a result in packing up software prices. This will affect everyone and may eventually depress the lowest users of devices like those of a retail utility.

The current trend towards packing

game boxes full of features, and play only may counteract this form of theft and will ensure that price-copers will never be quite the same as the original.

Before we look at the amazing range available I'd just like to remind everyone that cartridges should never be plugged in while the computer is powered up. You may get away with it once or twice but it's a sure thing that your computer and possibly the cartridge will come to grief eventually.

Most of these cartridges are available from mail order houses and good computer shops but some may take a little more effort to track down. I would like to thank Microscape (11 Science Rd, Watney, Macclesfield, LA5 4QM) for their help in supplying some of the cartridges mentioned in this article.

Quickdiaz+ / Evesham Micros / £19.95

This cartridge provides a LOAD/SAVE facility that's 5 times faster than the normal C64 user's pace plus a variety of other utilities.

The cartridge has a large red reset button

within easy reach. This button will hook into any program that has hooked up to the C64 and using the QLE command you can then restore your haggled Basic program.

The reset button may be the most useful feature and the lower LOAD/SAVE ability the most used but the cartridge



also contains a selection of commands accessed through two key presses or one of the function keys, as well as a copy for the user and replace flag.

Formatting a disk is a quick and simple task with Quickdisk II. Instead of typing in a label-free command and then having to wait for a wait a minute while the drive batters away, QNDP does macro-ED commands while disk is in your 30 sec slot!

Pressing F7 displays the disk directory which can be paged at any time by pressing the space bar. It's also as easy to search, remove or copy a file or to validate, label or simulate a disk.

Programs that are loaded in at 5-7 times faster (you won't appreciate this until you're used to it) can be loaded to a file address or into basic where it may suit the programmer.

If you've got a disk drive and you can't afford something like Dolphin DOS then you might like to pick up a copy of Quickdisk II.

The Final Cartridge / H&P Products / £39.00

The Final Cartridge has a freeze utility that can backup software and generate screen dumps. It also contains commands such as EMOND and AUTO software to support Calcomp's interfaces, preprogrammed function keys, DR, if extra RAM and a disk or tape mode that loads programs in or to ROMs faster.

When the C64 is switched on or reset via the cartridge button, a menu is displayed from which you can call up a comprehensive machine code monitor, double the cartridge, turn on the cartridge ready to load or create a program, save to tape or disk, or print a screen dump.

The Final Cartridge also contains a selection of useful commands that will make programming much easier. AUTO generates line numbers ranging from a specified number by a set increment value with the default settings providing line numbers 10-2000 and so on. REMUM incorporates your programs including GOTO and GOSUB commands into only two numbers. DEL creates a block of free lines. FIND lists every line in which a selected string of characters appears. HELP highlights tags when using programs. With APPEND and DUPEND you can add routines into

your programs that you have previously saved.

Disk users will appreciate the following commands that speed up disk housekeeping tasks, and display disk directories (as an alternative to pressing F7), load a program, format a disk, or SAVE and VERIFY a program on the computer's memory.

Tape users, who are often left out of the first loader wave, will relish the tape turbo that can save a program in memory through the normal tape commands but then reload it ten times faster than the normal rate.

The freeze stops a running program so that you can you make backup copies in a compact form but you'll need to use the cartridge to load them back in again. When you reload the program it restarts from where it was when it was frozen so it's important to freeze them at a convenient point such as a menu screen. While a game is frozen you can also double space to speed or spin in background collections. This may stop them from killing you and give you a chance to get further through the game, or it may stop you from killing them! It all depends on how the programmer wrote the game. Well you didn't expect it being in by that may did you?

While a game is frozen you can also dump a screen to a printer, either a serial Commodore printer or one connected by a Centronics lead supported by the interface built into the cartridge. The screen dumps can be printed in two sizes and feature full grey scaling for coloured images, but the finished result won't contain any part of the screen spaces as these aren't supported by the printer.

Finally the cartridge also includes a full machine code monitor that can be used to fill an area of memory, compare a block of memory, print out a block of machine code and directly manipulate blocks of information stored on disk, by using sector read and write commands.

The Expert / Trilogic / £29.00

The Expert cartridge is probably one of the most comprehensive cartridges available. Because the internal chip is RAM rather than the usual ROM, it can be easily updated to cater for the latest programs simply by buying a new disk for a fraction of the original cost of the cartridge.

As soon as you use the Expert you notice something is different because it houses a word bank, a three way switch marked



ON, OFF and PRG read-all-also-fail buttons and LEDs.

Much of the Expert disk contains files that either contain the information to transfer a difficult or under-load game or other routines to add extra levels and other things before making a backup. The saved backup is then compressed so you can get 2 or 3 games on a disk which each would require 10 normally.

The disk also contains a full monitor with a previous history and a series of utility routines including ones to edit and to double a game whose sprites may be of particular interest.

A lot of games use sprites which are animated to create the movement of objects, monsters and enemies that are out to maul you. The Sprite Animator routine enables you to freeze a program, display a sprite, view their animation and then save them to disk. A separate sprite editor on the Expert disk (which doesn't work with the Expert cartridge) can be used to edit or customize sprites for use in your own games or to load them back into a frozen version of the original.

The Sprite Animator can double sprites to sprite colliders and/or sprites to background colliders. This could save you a lot of hours as these are the colliders which usually kill you but they may also block the effects of your firing back, leaving you helpless.

The hi-res graphics and picture view routine can be used to grab any frozen hi-res screen and save it to disk. This saved screen can then be converted by another utility into a Kodakex formatted screen and placed and printed in normal. However edited hi-res screens cannot be loaded back into the original game.

If the cheat files don't work or there isn't time for the game that currently loses you, then the method may be found in the cheat machine section which describes how to freeze the game, load the code and alter the relevant bits. This cheating and is just one function of the Expert's full machine code monitor which is completely invisible to the user and can be used over the full 64K of memory. It can be used to access both Basic and Kernel ROMs and its typical functions are to inspect a program after a program, to fix any part of a Basic program, to write a machine code program as a hex to decimal converter and to search for

data, addresses or text.

Cassette users can get a special version of the Expert. It's the same cartridge but is programmed from a tape which includes tape to tape transfer routines.

Loading from disk or tape cuts the time you power up may sound fabulous, but it only takes a few minutes and allows easy and inexpensive updating.

The Freeze Machine / Evesham Micro / £28.95

The Freeze Machine is a bright red cartridge with two buttons, marked FREEZE and FREEZE. The Freeze function obviously freezes programs, ready for saving to disk but the Reset button is used to toggle between the games for Freeze Frame Mk V and Laser III, II both of which have been brought together on this cartridge.

The Freeze Frame menu allows you to turbo load and save some commercial programs as well as your own development programs in a fraction of the normal time, typically 70 to 100 seconds. This may not sound like a great time saving but can make a big difference to a program such as a word processor or database which is used everyday. You'll realize the difference if you ever have to load them at normal speed's pace after you've been using the cartridge for a few weeks.

Freeze Frame also includes a Game Killer utility to disable sprites to sprite and sprite to background colliders, plus options to fast forward, pause and validate a disk, display the directory and to resume or scratch a file.

The Freeze Machine also includes the Laser III system which saves frozen programs as USR files that can be loaded back in 10 seconds or less! Laser files can't be scratched (the whole disk must be formatted to remove them so your disks could become cluttered with unwanted files).

The Laser system has a similar set of utilities to those with Freeze Frame plus extra ones to convert PRG files to USR format.

The Freeze Machine is ideal for programmers who need to save development programs or second, but



they will miss the machine code monitor facility which is supplied in most of the other cartridges.

Action Replay / Dossoft / £24.99

Action Replay combines, say, combination of disk and tape transfer that you can imagine. It is also capable of backing up under-load programs and has a spin controller, fastloader, code inspector and picture view ability.





The Cardboard 5 is easy to use and produces a compacted fast-loading version of any frozen program. The final copy usually measures 128 blocks, so these games can be compacted on one disk and loaded up to five times faster than normal by flicking the load-out switch on the cartridge.

The Sprite Controller allows you to double sprites on screen, and save color and replace system and sprites into any game.

Any individual frame-by-frame can be frozen, grabbed and saved to disk and formatted for the Koolaid Pro or Blazing Paddles graphics packages and then they can be virtual mixed on better graphics and printed out.

Although Action Replay lacks a full monitor it has a code sequencer that, as a press of a single key, will display the current contents of the Program Counter along with three of the BRQ and RAM values. 6502 on-chip registers. You'll also BRQ mask, the user-compare latch value, the CIA ROM mask values, and timer latch values. Four options are then available: to load in a full monitor or load and execute a machine language program jump to any address or memory, display a block of memory, or screen to flow.

It also has a screen of Action Replay combined with Deductible II which includes a 10 second formatting routine, single keyboard disk commands, and a timer all for \$39.95.

Cardboard 5 / Precision Software / \$30.99 (plus VAT)

This board has slots for five cartridges, which can be switched on and not as required. A four status read buttons should prevent any mishaps, and a bank of LEDs for each slot shows you which cartridge is currently in use.

Dual Motherboard / Dual Electronics / \$36.99

The Dual Motherboard has three slots for cartridges, a safety fuse and a reset switch for the LED indicators.

Evesham Motherboard / Evesham Micros / \$28.00

A metal logic board that comes in two varieties. One has four vertically mounted cartridge slots but the other only has three with a handy through socket to fit a modem.

Stack Motherboard / Megadrome (Distribution) / \$28.00

A four-slot stackable motherboard with an optional modem slot facility.

Mother Load

With all these cartridges around you may well find yourself plugging and unplugging them from down old disk. It won't be long before the cartridge port starts to wear out with all this activity so why not invest in a motherboard for your cartridge slot before it's too late?



Fixtures and Fittings

A plethora of peripherals are available for all manner of specific jobs. Can you afford to be without them?

By Tony Hetherington

Some add-ons and accessories don't really fit in perfectly. They're not a disk drive, printer, monitor or graphics tablet but they're just as useful. For example, how can you use a printer in a busy environment without a stand to put it on with paper storage underneath it? How are you going to play a game without a robust joystick or safety store your disks without a disk box?

Add to all these devices which double your disk capacity—stop your data from hammering itself to pieces, generate volume on your monitor quickly and efficiently back up tape data files, or keep things generally running smoothly and you have the measure of the range of auxiliary equipment available.

INTERACTIVE DEVICES

Interactive devices include any form of joystick, mouse or related device. Beginning with the standard joystick controllers, there is an incredible choice for the potential buyer.

Matching the right joystick to the right type of game is essential as the wrong stick could cost you that high score. As a general rule you get what you pay for, a higher price generally means a faster more responsive stick with a quicker and more accurate means of joystick movement. As well as this, the higher price range often brings refinements such as shaped, responsive sticks frequently with extra fire buttons.

Economy Joystick - Suncom - £5.99

This is the basic Atari joystick that I still favour. It's cheap and cheerful but not particularly quick nor will it withstand the constant battering of joystick-style games. Having said that, Suncom is prepared to offer a one-year guarantee and you can thus replace your scratch boards when the bubble switches eventually wear out. In my experience, all my Suncom sticks have passed company with their bodies long before the switches failed.

The Economy joystick is also available from other sources but at a variety of prices as it was first introduced as part of the Atari XC's value game system. It's a basic joystick at a basic price.

Slit Stick - Suncom - £6.99

The best way to describe the Slit Stick is to say that it's small! A curved base makes it easy to hold and it has a ball top handle for an easy grip. There is very little play in the stick, the distance the stick is moved to make a selection making it ideal for rapid movement games.

Starfighter - Suncom - £8.99

The Starfighter is described as the ultimate joystick but is little more than an updated version of the Slit Stick with a custom handle. Commodore PC users should also note that there is a Starfighter MSX version that features an extra fire button and a £24.99 price tag. All versions carry a two-year guarantee.

TAC 2 - Suncom - £10.99

The TAC 2 Totally Accurate Controller is a high all-action stick. The steel shell will last almost any punishment and delivers the joystick movements to the steel contacts with the minimum of effort. The TAC 2 features a ball handle and a second fire button that gives left-handed players a look in.

TAC 3 - Suncom - £12.99

The TAC 3 adjusts the move switch



DAC 3 and gives it a pistol-shaped handle and three fire buttons. Two buttons are on either side of the base and the other on top of the handle. If you still can't hit the target with three buttons then the joystick will cause problems!

DAC 5 Suncom £11.99

On top of the Suncom range, the DAC 5 offers a pistol handle, three fire buttons, and auto fire/hold. That means it clicks when you push it so that knows when you've made contact. Ideal for games when precision is the key.

Speedstick Konix £10.00

Shaped to fit snugly in the right hand, the Speedstick has a small, ambidextrous control stick with accurate movement. It's designed to fit neatly into the hand so that the index finger hovers over the fire button. It is almost as if your hand then took charge of it; it does fit then it will give reliable service. It's up to you to do the rest.

This is one of the few products currently being produced with a C64 Parallel connector.

IconTrollor Suncom £19.99

Used with most serious applications in mind and also only need a joystick to select items, for example in GEM, so it operates the smart approach of the

IconTrollor. It's a one joystick that sticks into the right-hand side of a C64 or C128 keyboard and plugs into either joystick port but has a second easy-pull port and consists of a main stick and a shaped fire button.

Magnum Mastertronic Ltd £12.50

A variation on the joystick theme is provided by the Magnum's pistol grip design. The short stick moves on a very powerful top with gas, a strong return spring. The rear mounted fire button is ideally positioned for the thumb making this stick superb for purposes where absolute movement is required, but not very comfortable for rapid action shoot-em-ups.

AMX Mouse Advanced Memory Systems £69.95

The AMX mouse is the deluxe model of the Commodore mouse and features three buttons which makes it ideal to use with the Stop Press desktop publishing software.

Neos Mouse AMS £27.95

Based with C64 or available separately with support disk driver software, the Neos mouse is the cut-price version offering only two buttons and basic software compatibility.

TAPE TREATS

Doubler Eversham Micros £12.95

The Doubler is a very simple device that plugs into the cassette port and allows tape to tape backup of data. Two cassette disks are connected to the input and output sockets and the transfer is then controlled by the accompanying tapel program.



Load-It Load-It £19.95 £ 7.95 kit

The Load-It kit provides a reliable and effective answer to most loading problems. These problems are usually caused because the machine that recorded the program has a slightly different head alignment than your disc drive. This is why you might be able to load the game on your friends's computer but not your own.

The Load-It device replaces the head alignment screw with a knob that can adjust the position of the tape head assembly alignment. A graduated scale so you can note the settings that work for your business pattern and a pointer electro-magnet so you can hear when you get the correct signal. If the tape will won't load then the chances are that it never will.

DISK KITS

Dolphin Dos Eversham Micros £69.95

Dolphin Dos is quite simple, the disk operating system that Commodore should have included in the C64 and the C128.

If you're confident about developing then you can fit it yourself but if you're not then get someone else to do it for you because you could cause a lot of damage.

Once it's installed both in your computer and the disk drive, you can switch Dolphin Dos on and off from



switches on both units and have a parallel operating system that can load a 300 block program in just 5 seconds!

Dolphin Dos-1 is also fast and handy: a 300 block program in 10 seconds, format a blank disk in 30 seconds, 12 sets without VERIFY and speed up the loading and saving of sequential and relative files by up to 3 times the normal (24) read/write.

Even if you find a disk that isn't compatible with the high speed DOS, you can switch it off at the drive but keep it switched on in the computer allowing the use of the extended operating systems easy in real surroundings. For example pressing RUN/STOP becomes the equivalent of UNDO (or B1 SAVE) and REPLACE. Dolphin Dos style, works faultlessly and programs can be loaded from a disk directly or loaded on a printer at the press of a key!



much but this too will reduce the chances of your disk head creeping out of alignment and stop that hideous hammering noise.

The disk head 'hammer' is a bit like the rigid stop when operating still or with some commercial disk protection systems. The kit replaces the normal stop with a flexible spring stop that reduces the hammering sound to a purr and cuts out the jarring that can knock the head off alignment.

Supplying the control program on cassette may seem strange but it's perfectly sensible since your drive might be so out of alignment that it can't load a disk! The kit can quieten two drives.

1541 Physical Exam Evesham Micros. £3895

The performance of any mechanical exposure/disintegrator with up and a disk drive is no exception. In time the speed will vary outside the safe limits and possibly the alignment will drift. Correction is relatively simple but may cost over £30.

Evesham's Physical Exam is a high quality product which will detect all types of error which may occur with the disk drive. After no five use the kit will have paid for itself and after that you'll be in profit.

Head Cleaner - Suncom - £5.99

This is the disk equivalent of an under tape head cleaner. The cleaning disk and bundle of solvents is enough to spruce up your drive head 15 times and helps to reduce read errors and, in bad cases, will avoid physical damage to your disks.

Anaga owners will be interested in the 3.5 inch version that costs slightly more at £6.99.

The Notcher - Suncom - £4.99

This amazing hole puncher cuts into your memory and disks. All it does is to punch a second, correctly registered write protect notch allowing you to use both sides of a disk.

Although some disks are sold as single sided, all disks are manufactured as double sided and quality control sorts out the quality rating they are given. All this means is that a single sided disk is not guaranteed to work on both sides although most do. Obviously it's essential



that you try the disks before you save the only copy of important data or rely on data in emergency.

The Notcher is supplied with a pack of labels and write protect tabs.

Disk Coupler - Computek Microsystems - £4.95

A robust version of the Notcher for heavy handed disk users. This one lacks the catalogue labels of the Notcher pack.



1541 Quiet Drive Stops Evesham Micros. £4.495

A cassette tape containing one slow safety program, an instruction card, two washers, and two metal clips may not seem



Diskit Suncom £17.99 = £25.99

The Diskit series is a range of disk boxes, complete with a heavy roll-top lid that snaps tightly shut when you open the box and won't fall on your fingers.

Diskits come in either single or double boxes that hold 60 or 120 of your 5.25-inch disks. Both types have an optional lock, hence the range of prices. The fact now is that they are supplied in fliplocks and have to be assembled but if you keep your cool and the rest easy, this shouldn't take you more than a few minutes.



Disk Boxes - various makes - £7.50 - £11.70

A disk box needn't cost you as much as the Diskit, the standard type with lift-up clear plastic lid is available in a variety of shapes and sizes from an array of companies ranging from Master Court

Supplies, box capacity 30 disks - £7.50 and Mo, models box capacity 60 disks - £11.70

Alarmed Disk Box - Inmac £39.95

If your disks contain particularly important information and you're worried about burglars, then you'll need Inmac's Alarmed Disk Box. It features a built-in movement alarm that switches, at 98 decibels for 15 seconds whenever somebody tries to move it.

IN PRINT

Printer Stands - various makes - £6.99 - £39.99

If you've ever tried to use a printer in a bare room or office then you'll appreciate the need for a stand that neatly stores the paper underneath the printer. Then, for a complete system, you could add a paper tray to collect the paper as it comes off the printer.

Suncom have a wide selection of rigid wire-framed printer stands from 12 to 34 inches wide that range from £6.99 to £39.99. The Papermate costs £10.99 and is a pair of printer stands which function all printers.

A paper tray which will clip on to the back of any wire-framed printer stand and cost Suncom's value at even £1.99 to the retail cost.

Macromedia's printer stand is made to fit all 80-column printers and is built from 5mm clear plexiglas and costs £19.95.

Printkit IV - Avon Printer Technology - £260.00

Not to be confused with the Printer IV the Printkit IV fits into the MP1500 to add true descenders to the original character set. Itals, underline and bold modes are added as well and Printkit speeds up the printer's operation.

Printer IV - Dated - £20.99

The Printer IV is a replacement character ROM for the MP1500 printer that provides the user with four new character sets that can be selected by setting the

position of two switches.

Once installed the Printer IV is compatible with all software and will print your text out in either Descender, Italics, Strike or Future character.



ON SCREEN

Swivel Bases - various makes - £15 - £15.99

Swivel bases or monitor stations are revolving and tilting platforms that allow you to ensure that your monitor points directly at you when you look at it, taking the pain out of the task of computing.

Suncom's Monitor Station £15.99 supports monitors with a screen size up to 14 inches and has a locking system so you can keep the right setting once you've found it.

Mo, models has a choice of two sizes of swivel base size for 12 inch monitors £12.00 and a larger one for 14 inch screens £15.00.



Glaredown - Suncom - \$1299 - \$39.99

Available in two sizes and prices the Glaredown is an anti-glare screen that fits over 12 inch or 14 inch screens. They effectively eliminate glare by reducing glare from sunlight and overhead electronic lighting, rendering the screen almost invisible.



VIDEO ON

ComputerEyes - Stern Computing - \$119.00

The ComputerEyes Video Acquisition System converts a video picture from either a good video recorder or preferably a video camera into a format that can be viewed and used by your C64.

The unit plugs into the user port and is connected to the video source via a video cable. The unit begins at the press of a button and takes about six seconds for a full gray-scale image to be stored on disk.

ComputerEyes is controlled by a menu driven control program that can be supplied with additional disks to allow the captured picture to be converted into RealPict, Double Pictures, Print Shop or Newsroom formats.

Teletext Adapter Microtext - \$89.95

By using the TV modulator built into a domestic video recorder and the display settings of the C64, Microtext has produced a teletext adapter for a fraction of the normal cost.

By connecting the video to the plug-in adapter via a 20 pin cable you can get a superb teletext picture on your computer screen. The adapter continuously updates and improves the picture on screen with the result that the picture is even better than on a teletext television!

Now you can check on the weather in Tokyo or find out what car will be at the cinema, check the road reports and then store any of these pages of information on disk and print them out later.

You can also write your own BASIC programs to read teletext pages and use the information in them for such purposes as a football pool predictor database, or re-plan your next menu on the Stock Market.



MISCELLANY

Documate 2 - Suncom - \$12.99

The Documate 2 is a free standing document holder complete with clipboard and adjustable ruler to ease the typing of all letters.

Copy Holder - Micro Media - \$12.99

The Copy Holder is an adjustable version of the Documate 2 but also contains a clamp to secure it onto the edge of a table.

Smart Card - Datel - \$34.99

The Smart Card is a battery backed 8K RAM cartridge onto which you can save or load almost any program you require. After loading the program into the cartridge, you then flick a switch to keep it in instant cartridge recall format for up to five years.

There is also a larger 12K version & detachable 8K banks that drop £19.99.

Reset Cartridge - Datel - \$5.99

This is simply a reset button that helps programs so you can type in a new file faster.

Cartridge Development System - Datel - \$12.99

This kit contains all you'll need to build your own cartridge and includes a 8K Eprom, P.O. reset switch and red plastic cartridge case.



Heavy Metal Hardware

If music be the food you love then read on

The Commodore 64 and C65 may have the best sound chip of any single-bit computer but this doesn't make either of them the ultimate music machine. There may come a time when you get a touch of the Oliver Twins and decide that you want more — which means plugging an external music hardware to get a greater range of sounds with more control over them.

Music add-ons fall into one of three categories: external sound generators, sound samplers, and MIDI interfaces with their associated software. Each category extends the capabilities of the C64/C65 but the latter talent must be provided by the user. Music extensions bring the world of Buchla, Moog and the like into the realm of the common man without the physical dexterity necessary to play like a virtuoso performer.

Using the Commodore with music hardware and software can turn a run-of-the-mill machine which not only provides hours of entertainment but can also be used as a powerful music theory teaching aid.

Sound Generators

These provide an alternative to the sounds generated by the built-in chip, adding more

and better sounds thereby opening up a wider range of possibilities for composers and arrangers.

The **Commodore Sound Expander** (C6999) falls into this category, bringing FM synthesis to the Commodore. Apart from eight channels of sound you also get rhythm generators, auto accompaniment, single finger chords, and a 160 sequence amongst many other facilities.

FM (frequency modulation) synthesis was pioneered and popularized by Yamaha with their range of DX synthesizers. Though FM many sounds and environments can be accurately duplicated as well as many new and unique sounds.

The cassette version of the Expander comes in 12 preset modes but the disk version caters twice that number. Although tricky it is possible to create and edit your own FM voices but the Expander package does not allow you these facilities which means that you

could now run on a lot of the potential of FM music, but helps a bit here!

For as little as £29.95 the **FM Composer/Editor** gives you simplified editing control over the Expander's modes, provides a voice library system and the Composer part of the software lets you create and store your own compositions. I would certainly recommend that anyone who buys the Expander should also budget for this.

It is possible to play the Expander from the Commodore's QWERTY keys but if you find that too awkward — and it is! — you'll at least need the **Music Keyboard Overlay** (C6998) a plastic, piano-style, clip-on keyboard which fits over the relevant computer keys. If you want a more professional keyboard then, the five octave **Full-size Keyboard** (C6996) which is ideal for this, with previous keyboard experience.

At this point it's worth mentioning **Music Maker II** (C64/C65) and **Music**



Musler (D44-99) These both contain the Musler Keyboard Overlay and programs which help you to play and record using the SID chip as the sound source. Both sets contain ten preset sounds and you can record tunes using the **SPX Play-Play Sequencer** and play them back with or without digital backing.

If this idea appeals to you, you can also buy three **Playing albums** for £9.99 each: *Popular Classics*, *The Beatles* and *Pop Mix*. The albums include a disk or cassette and a music book with lyrics and tips about playing.

The **Sound Studio (D44-99)** is called in *ProSound Synthesizer* and **Recording Studio**. While I doubt if even Trevor Horn could make a hit record with it, you do get a pretty good introduction to both the SID chip and the recording process. The package is split into two parts: the **Synthesizer** and the **Editor**.

The **Synthesizer** gives a brief rundown on sound pitch, number, volume, vibrato, portamento, ring modulation, synchronization and SID's filters.

Using the Editor you can enter music in real-time or step-time. Music can be recorded on three tracks as far as you have a MIDI interface but you'll need a synthesizer (or most of you want to play back these extra tracks).

The **Sound Studio** can be played using the Keyboard Overlay using a MIDI interfaced keyboard or from the **Sound Expander's** Keyboard. See how it all ties up?

Everything mentioned so far is available from Musler Sales, although many other shops and mail order firms also stock them. There is a special package called the **Commodore Music Experiment System** which contains the Full-size Keyboard Sound Expander and **Sound Studio**, all for £49.99 — a saving of £44.98. Shipping around could save even more because the CME System has been advertised for less than £40 recently.

Sampling Sounds

A sampler is a device which "tunes" to a sound and converts it into bytes stored in the computer's memory to process (known as digitisation). The problem is

that samplers use RAM like human cat litter and in order to produce clear sampled sounds you need to store lots of bytes — and that means you need lots of RAM. How useful is then a computer such as the Commodore with less of RAM waiting for bytes to be stored in it. Despite this, you still have to make off available RAM and sound quality.

Larger time I'm afraid. In connection with sampling you'll hear terms such as sampling rate and bandwidth. Put simply, the larger the bandwidth and the faster the sampling rate, the better the quality of the sample — and the more RAM it will use. Most samplers let you select the sampling rate so you can choose the optimum value for the sound you want to digitise. With speech, for example, you can often get away with a relatively low sampling rate. Drums sounds are generally pretty short and can also be recorded at low speeds without too much loss of quality. We'll come back to drum software later.

In order to turn sound (analogous quantities) into numbers (digital values) and back again, samplers use an ADC (not surprisingly standing for *Analogues to Digital Converter*). This is the hardware part of the package and the quality of the sound will also depend on the quality of the ADC.

The **Commodore Sound Sampler (D49-99)** from Musler Sales, plugs into the cartridge port and comes complete with its own software and a micophone. It gives you 14 seconds of sampling time at 20,000Hz which makes pretty good quality. You are then given a graphical representation of the sound which can then be altered in several simple ways.

Four short samples can be stored at once and played back on a 40-note sequencer. Sounds can be reversed, looped and played back at different pitches. Special effects include echo with variable delay and a harmoniser which does funny things to instrumental sounds and can make you sound like a robot with a sawt tooth.

The **Sound Sampler** is MIDI compatible (although a MIDI interface is not supplied) so it can be used with the Keyboard Overlay.

Daniel also has their **Sampler** which works on a good deal cheaper at £49.99. A microphone is also supplied with this package and it has MIC and LINE-IN

sockets with feedback control.

You can alter the sampling rate (the trade off), mix samples, play them backwards and loop them. It has ring modulation and echo facilities, too. The screen display shows the waveform which can be split into eight sections so you can store eight samples at memory at once. Patterns can then be recorded and saved through a sample sequencer.

Samples can played on the QWERTY keys and the package is MIDI compatible — try Daniel's own MIDI interface.

The top Commodore sampler is the **Microson Sampler** available from Supersoft at £29.95. Software is on disk, but a Pro version with extra features is available on a cartridge for an extra £70.00. Both versions are MIDI compatible.

The program is controlled through a series of menu pages and offers eight sampling rates. The waveform can be edited by placing coloured flags at the editing points and the sound can be run through compensating to reduce aliasing (harmonic noise). The Pro version also contains an Auto-Looping Tool which tries to find glitch-free loops.

You can store up to 16 samples at the same time and a small sequencer at least lets you program up to 24 patterns, enter into a drum machine, but you are limited to 40Hz here and the samples can only play monophonically (one at a time). The speed of the sequencer can be controlled by an external MIDI clock.

If you want to process incoming sound the basic model has a digital delay and the Pro cartridge includes harmonising, flanging, phasing and modulation effects.

Drum Machines

Producing rhythm tracks has a certain fascination which seems to not share the musician/layman divide. Professional drummers are also amongst the most in-sightful — on a hardware/memory space anyway — purely because they use short delays around a tenth of a second (sometimes) and don't have a large harmonic range. Cymbals are an exception having a surprisingly wide harmonic range for such a simple instrument.

Daniel's **Com-Drum** at £29.99 can store eight pre-recorded drum sounds in

memory at once and the output can be characterized through your TV or your hi-fi system. It comes with three separate drum kits with some sounds being used more than one kit. The quality is quite good (bearing in mind the price) and considering that you'll pay over £200 for a dedicated drum machine.

Drum patterns can be entered in real-time or step-time with up to 32 beats per pattern in 4/4 time or 2/4 time or 3/4 time. The program can store eight patterns (not a lot) which can then be chained together to form a song. There's an external sync facility for linking through to a MIDI interfaced synthesizer.

The standard Com-Drum software won't let you alter the three drum kits supplied but with the Com-Drum Editor (£4.950) you can rearrange the 24 sounds to produce new kits.

If you already have the Dandel Sampler you can buy the Com-Drum software to use with it and then your sampler runs a drum machine for £9.99.

Slightly more comprehensive and a little more expensive at £39.95 is **Rhythm King** from Supersoft. The basic package contains two kits of eight drum sounds but additional kits are available. You can record in real-time or step-time and you can play more than one sound at the same time. Up to 64 drum patterns can be stored in memory and combined to form up to 16 songs.

There are keyboard and joystick options for entering the patterns and the editor is fairly easy to use. When you're satisfied with your composition, the patterns and the songs can be saved for recall at a later date. The Commodore 124 version of Rhythm King runs in 40 column mode.

This drum system would not be complete without mentioning Preload's **MiniRhythm**. Although it's purely a software program, for a mere £1.99 you get 16 sampled drum sounds, to arrange new patterns and songs which can be played through the TV or VDU monitor speaker. There is a provision for saving and loading sounds so perhaps Preload are planning to release other kits in the future.

Stereo Split

If you want to hear SID sampled sounds,

or anything else that originates from your computer a little more clearly, you could take a look at the **Sound Splitter** from Trilogic.

The basic version costs £29.95 and gives you a two-channel stereo effect plus reverb. A lead is supplied for plugging the unit into your hi-fi or stereo unit and there's a monostereo intensity control.

For an additional £5.00 (ie £34.95) the **Sound Splitter+** gives you a built-in headphone amplifier (you provide the headset) plus balance and volume controls. That should keep both you and the rest of the family happy.

MIDI Interfacing

Even if you settle with only half as our towards music, you are almost certain to have heard of MIDI. In case you haven't MIDI is an acronym for Musical Instrument Digital Interface. It is a set of digital messages agreed upon by musical instrument manufacturers which allow instruments to communicate with each other. This communication takes place via three types of MIDI socket or you can plug a cable together a number of instruments.

MIDI really comes into its own when used with a computer. Sequential software enables you to store compositions in the computer in the form of music data. Good quality software will allow you to enter musical notes by either of two systems, you may be able to record in real-time (that is you play or enter music one note at a time in step-time). The music is stored as a series of numbers so it is far easier to manipulate than an audio recording. Tracks can be merged and you can edit individual notes with a degree of accuracy impossible with an audio tape recording.

To do all this, however, you need a MIDI interface. That's the core of the system but like a computer it is useless without its own software, which is what the main body of this section is about.

If you are recording on to a multi-track recorder you will need an interface with a sync-to-tape facility which logs down a lock track on the tape. This ensures that all subsequent recordings keep in time with one another.

MIDI can also be used for voice

editing. Digital synths are notoriously difficult to program because most of their parameters are figures. A voice editor can give you graphic displays of these parameters to aid programming. A library system then permits you to store voices in a disk and this library feature alone is usually worth the price of the program.

Most Commodore MIDI interfaces plug into the cartridge port and one manufacturer's software may be compatible with another's interface. Note that ports will compatibility cannot be guaranteed and the value of some action is to use one manufacturer's interface and associated software. With the cost of most MIDI software being so high many suppliers will advise on compatibility between products and may even allow you to try it with your own MIDI interface.

In the interests of showing the range of MIDI software, the following list is necessarily brief but most companies will be happy to supply further details about their products.

Soft Choice

Five names, besides to most MIDI users are now companies by their absence from the British marketplace. Sequential, SHI, Steinberg and Dr T Sequential still have no UK distributor and they don't seem to be particularly interested in getting one. Steinberg and Dr T are no longer distributing Commodore MIDI products although you may still see their products in some shops. SHI have now closed their doors for good although you may also come across some of their products, occasionally, and mention is still made of their interface which was something of an industry standard.

It's not all bad news though, there are many new companies willing to fill the gaps left in the marketplace.

Although **Cherish Marketing** does produce anything specifically for the Commodore they do stock several impressive keyboards which are worth considering as your music set-up expands.

They have four **MMW Master** keyboards, the basic **MMF** (£59.95), the **MMW** (£99.95) with pitch bend wheel and patch change buttons, the **MMFV** (£129.95) with a velocity-sensitive

keyboard and the **HW745** (£299.95) with a seven-column velocity and after-touch sensitive keyboard.

Chordans are also developing the **MTM Digital Piano Machine** at £199.95 and the **MTM Synth Module** at £249.95, which should be appearing in the shops as you read this.

C-Lab produce their own interfaces and matching software but their software will also run with a Synclavier interface amongst others.

Distributed in this country by Sound Technology the standard **C-Lab MIDI Interface** costs £29.00 or you can buy one with a tape storage facility for £65.

The **Super Track Sequencer** (£25) software is basically geared towards real-time input but you can also record in step-time. One major screen shows all your options but for editing you go to the **MIDI Event Editor** which gives you access to the bus and types of the MIDI protocol. It's one of the best-regarded programs on the market and fairly easy to use.

A recent release from C-Lab is a six-track, wave-writing package called **Sound Track** (£24).

Datal produce one of the cheapest MIDI interfaces on the market at a mere £20.99. Although compatible with their **Sound Sampler**, Datal have no software to drive their interface yet but they claim that it is compatible with most leading software (MSB MEL, the Advanced Music System and Jovite). Always check with your software supplier to make sure.

ElectroMusic Research are arguably the world's most prolific producers of MIDI packages and have made hardware and software for almost every popular home computer. Their **Commander 64** only has costs £99.90 and they also produce a unit, now called **MAWIKII** (£24.95) with one MIDI IN and six MIDI THRU outputs, but connecting several pieces of equipment.

They only have one software program for the C64, also which is the **MultiTrack Performer** £49.95, an eight-track, real-time polyphonic sequencer with features such as punch-in one punch-outs, thought track mixing and transposition.

Elektron have special package

deals in Christmas, and at User Shows, to phone for current details if you're thinking of buying one.

Jellingham, for IBM's have almost bowed-out of the market but you can pick up some bargains from Synclavier Music who are currently handling their range. Supplies may be limited, however.

The **IBM RMS 2M Interface** (£29.95) was made, but then by SML, now defunct and has a MIDI IN, a MIDI THRU, three MIDI OUTs and an external CLOCK - 95.

The **12-Track Recording Studio** is a real-time package which holds, solitary after-touch, punch-and and punch change information. It is quite easy to use once you discover how it works, because the manual could be better. Despite this it's still a bargain at £19.99.

The **Sequencer Chain Program** (£29.95) allows sequences to be linked to produce changes in time, sequence and tempo.

The **Sequencer Editor** (£29.95) comes on EPROM and contains three programs: the 12-track Recording Studio, the Sequencer Chain Program and the Sequencer itself.

The package produces a hard copy of your score, including the lyrics, but you may have a lot of setting-up to do to get the results you want. The manual could be better but the printed notation is very good.

The **SoftTrack Sound Editor** is a mere £9.90 is a simple editor for Sequential 3, SoftTrack and MAX polyphonic.

IMP also have a very simple **DAT Junior Editor** for the Yamaha at £29.95. **Jerrell's** eight-track **MCS (Music Composer Sequencer)** at £25 includes their professional AL25 interface. The software allows both real- and step-time sequencing.

Step-time entry uses a simple MC1 (Music Composition Language) and notes appear on the screen as they are entered.

This is nice and easy system it's the best step-time entry systems around with comprehensive editing facilities.

Amith's software offers a significantly different approach to most other products and has attracted a great many devotees. It's features make it one of the most comprehensive C64-MIDI sequencing packages on the market.

The **Real-Time Part Loader** (£18.95) allows the loading of real-time files, part by part, from multiple files (you'll realize the usefulness of this if you have the M23).

The **Key Programmer** (£1.85) accepts input in any key for even no key, in particular it allows key selection before printing.

A quality **Cassette** £2.50 price editor which includes features like envelope, copy and mix - saving can be found in the **C2 Time Editor** (£44.95). Musicians can be saved an disk which saves a fortune on RAM packs.

If the ability to link, loop and repeat up to 128 sections of music with remote processing is important to you, the **Linker Version** is a suitable extension of the real-time part of the MCS at a cost of £94.90.

System 7 (£29.95) is a score editor for Yamaha DKT and TXT synths which is designed to allow the creation and naming of your own banks of 12 voices. The system has lots of facilities and comes with 120 pre-programmed sounds.

All Jerrell's programs can run with other interfaces although their own AL25 is a very improved device complete with comprehensive sequencing facilities and is worth considering as your first interface. Because the AL25 plugs into the user port software from other companies is unlikely to work with it, but the Jerrell range is so comprehensive that you may not need any other programs!

Amith have lots of package deals if



you want to buy more than one of these programs. For example, the Linker and the AL25 Interface is £199.95, System 3 and the AL25 is £99.99 and the C2 Editor is offered at £129.90 with the Linker.

Powertop Design's C24 interface (C24) has MIDI IN, MIDI OUT, drum sync, input and output at 24, 48 or 96 ppm (pulses per quarter note) to suit most drum machines. A version with tape sync is also available at £199.00.

Something of a rarity is **Powertop's** **Music Shop for MIDI** (£199.95). Many are critical on step-sequencers as a means of musical notation and the program can produce a printout of your piece at the end. It is very easy to use, but much of the MIDI notes it is not supported, a fact which will not worry many users but should be borne in mind. It works superbly with multi-instrument instruments such as Casio's CP systems. This package forms a very easy introduction to MIDI and represents good value for money.

Eight track sequencing is offered by **Master Tracks** (£199) with multi- and step-time facilities. Step-time options include full MIDI notes and data editing. Notes are described as notes plus octave number up. C9 being made less you build up a song from pre-recorded sequences and the fact it is a very flexible program.

Powertop also have voice libraries (see voice editors) at £65.00 each for the Yamaha DX7, Roland DXF, Casio CZ series and Korg's DW systems.

Also available is the **MIDI Player** (£65.00) which steps up to eight songs or arrangements on a disk and produces a synchronised video display on the screen during playback.

THE MUSIC SYSTEM



Mastered Software's **Advanced Music System** (£199.95) is designed to help you get the most out of the MIDI chip but it also includes a novel MIDI module which lets us a voice-track real-time sequencer.

Although not at the same league as the other dedicated sequencers mentioned here, it is certainly interesting. Its ability to convert notes, files, from MIDI and real-time is an experience in itself.

Source International are well established in America and have recently opened a UK office. They have lots of products for the Commodore 64 and look as if they could make a name for themselves by filling the gap left by Soundberg. Of 7 or 8. Their range of software includes many facilities, not available elsewhere for the Commodore 64 and 128.

We'll start with their MIDI interfaces. The standard interface at £149.00 has one MIDI IN and two MIDI OUTs, while the £219.00 you can have one with sync facilities.

To find new notes into the world of MIDI, Source have an introductory program called **Goodwords** (£149.00) which actually not a software manual on the 128A. It is a basically real-time oriented but with some step-time facilities. It has eight tracks plus comprehensive editing capabilities and the program includes several demo songs and is very easy to use.

The **Beginner's Sequencer** (available at the **Super Sequencer** £119.95) and there are sequencers for both the 64 and the 128 to take advantage of all available memory. It can hold in sequences over eight tracks and contains a system-exclusive library to save for example an entire bank of DX7 voices. It has many editing facilities and with the 128 version you can use your keyboard as notation wheel as a volume control.

Personal Music can do £129 (£199.00) has file compatibility in the other format systems and is designed for new MIDI users. The package includes all cables and a MIDI interface.

The **Mini Processor** (£199.00) can be used to perform your recordings. With a job can load files from the Super Sequencer and perform elaborate cross and range editing on them. Features include the removal of pitch changes,

pitch and real wheel after-math, various pedal volumes, and channel information. You can also programme custom information from a channel and put it on another track, clever stuff.

Music 64 (£199.00) is a mixture of system-exclusive library program. It is a view, manipulate and save MIDI files, as they are transferred from any MIDI instrument. It includes MIDI filter, trigger functions, and a print-out capability for sequencing systems exclusive dumps. - more hi-tech talk but buyers will find it very interesting indeed.

It hasn't seen it yet but **Microtrack** (£199.24) promises to be worth a close look. The final version should be ready by now. One of the main features available is the ability to produce the scores in traditional notation.

Finally, there is a range of voice editors and libraries. Space is limited so it will have to suffice merely to list them if you're interested you can get further details from Source or you can sample their notes with a Source Demo Disk for £10.00 plus £1.90 post and packaging. **DX - TX** £149.00 **Design** (£95.00) **DX - TX** Digital Books (£49.95) containing 81 banks of sounds.

DMC Design (£95.00)

DMC 2700 Support (£109.95)

DMC 2700 Library (£149.95)

DMC 2700 (£95.00)

Elvis Programmer Library (£149.95) **Elvis Digital Books** (£149.95) with 81 banks of sounds.

James Editor for the Evening Manager (£199.00)

Source Editor for Sequencer's **Prophet** (£199.95)

Summary

A computer can help the less-professional musician produce musical and complex pieces which would otherwise be beyond his ability or take advantage of this aspect every time I plug into a MIDI program. It can serve as a compositional arrangement or musical thinking aid and of course it can be used just for fun. Personally I believe music should be enjoyed and the Commodore certainly gives you plenty of options. Whether you're a professional musician or a novice, there's a package somewhere to suit you.

Life in the Fast Lane

Turbo charging your snail paced peripherals opens up a wide and confusing world of cartridges, tapes and chips.

by Norman Doyle

Cartridges, tape and disk systems are probably the most reliable available on any microcomputer but they are also the slowest. In my old VIC 20 days, this wasn't too much of a problem with only a few kilobytes of memory to fill but even with the C64 loading can take a 1-2-3-4-5 time.

The software houses solved this with their own fast load systems which revolved in various like Turbo and Blaster but it has been the cartridges, revolution which has made these kind of facilities possible to the home programmer. Much of this revolution started in Germany and Holland where Commodore owners were so approach programming their machines with a Teletex, game for order and control.

Companies such as Robert, Everham, Maxon, Guel and R&P seized the opportunity to step up these foreign products and launched them on the British market. In many cases the popularity of these products was not just because of the fast loaders and users but the back-up facilities which allowed compressed

games to be transferred onto disk or tape.

The first fast load facility that captured me to this fact, that my 194 could actually operate faster than normal was *Disk Express* and *Flash!* which both originated from *Imagisoft*. *Disk Express* was a plug in device which channel a modest increase of five times the normal loading speed and could be fitted on seconds. *Flash!* was a little more sophisticated and required changes to both the C64 and the ROM.

To fit *Flash!* caused a problem for most C64 owners because the basic ROM chip had to be removed to make room for the new operating system. The space left by the newly discarded chips could then be filled with a DRI, which is like the new operating system chip assembly. The problem was that the original ROM chip had to be reinserted into the new assembly on any cartridge chips with the widening iron and test work would cripple the computer for several weeks, until a replacement ROM could be acquired.

Inside the disk drive the problem was not so dramatic. For many years all the

major chip components on the drive boards have all been held in sockets and could be removed by gentle leverage. A connecting lead from the user part on the C64 to the drive that supplied the data line with a switch to select *Flash!* or normal operating modes.

A side benefit of the new system was that the new operating system drive gave



some extra commands to move the program. Cursor movement was controlled by commands to move the cursor in an area of the screen in large jumps. As in the **HELIX** key, moves the cursor to the top left corner anywhere on the screen, so the new system allowed a visual learning of the cursor to the bottom right, jumping to the end of lines and outside of large areas of the screen at will.

Flash was variable for a limited and skilled few who could afford the expense of a new system plus the cost of having it inserted if they lacked the ability to do it themselves.

In real terms the speed increase with either of the improved systems was only about twice the normal, nowhere near the claimed five times improvement. This is something worth bearing in mind when reading advertisements, the stated speed benefits always take the optimum conditions into consideration. As a general rule always take the advertised ratings to get a more realistic figure.

Next in line was a cartridge based system from **Robotek**. The **Robotek** system could be used by the owner simply by plugging one of them in. Taped this range was **Robotek Turbo 90** which increased disk speeds by five times, and had a cassette system which was ten times faster than normal. Additionally the user gained extra very useful **Flow**, **Wedge** commands which allowed programs to be merged, also ran with a **TRACE** facility and based in a page system one was used at a time. There was also a simple manner to insert machine code programs, to develop and check their own programs.

Unfortunately the one disadvantage of this system was the fact that it distributed itself from the cartridge and into the computer RAM. This greatly inhibited use and meant that it could only be overwritten by long files, programs or by machine code.

This brings us up to the recent past and a new series of cartridges and devices, but before we go on to these innovations you may still be wondering how as possible to speed up a typical disk system.

Routine changes

One myth which should be firmly knocked on the head is that tape methods

usually speed up the recorder. A cassette recorder works at just under two inches per second and there is no practical way that it can be speeded up or slowed down without internal mechanical or electrical changes. The use of tape methods results in the system of the reliability which is built into the standard operating system.

Under normal control each bit of every byte is recorded in a form of electrical Morse code, signifying the weights and ones of binary. Added to this is an odd parity bit whose value depends on the preceding eight bits. This is followed by another signal which indicates the end of a word, the nine bits of data. Then the next byte is recorded.

After each block of 80 bytes the computer leaves a two-second gap (once again adding to the length of the record) before turning on to the next block, the system to record the previous block to ensure against tape droopings corrupting the data. This means that each program is effectively recorded twice to ensure reliability.

Simply by dropping into the structure of the tape system over 50% of the normal loading and saving time can be achieved. For many loaders this is increased to a greater degree by cutting the lengths of the pulses which form the Morse code used to record the data. This increases the bit rate or number of data per inch on tape but does make it more vulnerable to failure.

The tape speeds achieved with a well-designed turbo now equal that achievable with a disk drive head. Accordingly the tape recorder is no longer a top-to-top condition. The recording head must be accurately aligned and the use of an accurate alignment tape is essential. The **Robotek Turbo 90** has a built-in alignment program and separate tape for this purpose. I know of no other system which applies such thought and for most people their only reason is to insert more money in one of the commercially available alignment systems such as that produced by **AudioLogic** or **Acumatic 3000** from **Everdram** Mirres.

Disk turbos can work at one of two ways. Either the head rate (the speed at which it communicates with the computer) is changed or the way that the program is physically stored on the disk is changed.

The most radical disk turbo system that I have met is marketed from **Chakram Software** of Australia. This took over the normal disk storage system and formatted the disk to suit its own requirements. Unfortunately this does not help when accessing, as disk is acquired and it has no turbo of its own. It's far better to get a system which accepts the disk storage system on the 1541 but up the head rate.

Today's Turbos

Much of the attention these days is lent to seventh disk turbo systems which at best can achieve speed increases of up to 25 times the normal rate.

Most turbo systems are only available on cartridge. Unlike the **Robotek** cartridge this new generation is virtually available in the system. Rather like an electronic wallet, the top of the system only protrudes into a few lines of the C64 internal memory. The main part of the program resides externally within the cartridge, totally undetectable.

If it is a no-nonsense turbo-disk operating system that you want then it is still possible to buy **Quickdisk+** from **Everdram** Mirres. The **Quickdisk+** system offers a basic operating system giving five to seven times a speed increase where commands are similar to the DOS wedge supplied on the demonstration disk which comes with the 7541.

The system eliminates the necessity to type in GPNs, commands to read error channels or read disk commands.



replacing the cassette and tape transferring system with a single keypress. It also has a facility for linking the diskette onto the system's single Commodore printer driver and a help menu for only \$29.95.

Datal has a cartridge to compete with the speed of Quickdisk. Called **Freemove II**, it not only has a more affordable price at just \$44.95 but also has a wider range of functions, including extended files, comments and a monitor.

It's **Freemove** who supplies the excellent **Freemove Machine**, which absolutely thrives with facilities apart from its disk and tape transfer. The speed of the transfers is further enhanced by the requirement of a program to operate on the cartridge. This reduces the program to the minimum possible number of bytes and then re-expands the program after loading.



The **Freemove Machine** contains two fast disk routines. The first is equivalent to the Quickdisk system going about five times normal speed but the second, **Fast II**, system claims an amazing 20 times faster than normal.

The only drawback with the **Fast II** routine is that it saves the program file as a 1088 file on disk. This means that transfer and drivers of the program is expensive. If you want to restore a program from a **Fast II** disk, then you have to load and re-save the programs that you want to keep onto another disk and then restore the old disk.

Despite this, **Fast II** and the **Freemove Machine** form the fastest combination of

any cartridge system. **Dorham Micro** claim that you could load your business game in as little as ten seconds and its more than 80 Commodore tags that the **Freemove Machine** only costs £28.95.



Action Reply, **10,000's** companion program, **Range 25** claims to be the fastest file loader available. Unfortunately it wasn't able to load this claim but I do note the difference is particularly significant over **Fast II**. What is important is that it can be obtained instead from **Datal** for just £2.50.

At £30 and with a disk speed with six times normal, the **Final Cartridge** from **MSF Computers** may seem to be a bit out of the norm, but it has many other things to offer in addition to its disk speed. If your needs are for a faster disk system but backed-up by plenty of files, facilities and a machine code monitor then this could be well worth the money.

My favorite system is the **Trilogy Expert** Cartridge. Unlike the other

cartridges, this is a RAM chip which can load the entire **Trilogy** software loaded up onto it. The disadvantage of the system is that any spike through the main supply will upset it and require the system to be reloaded. This is a small price to pay, I feel, for a system which can be kept at the forefront of the backup and disk speed revolution at low cost.

The other nice thing with the **Expert** is the way that its memory drops in with a routine of its memory location at which it was interrupted, a fantastic debugging facility.

I think I've digressed a little! The main point about the **Expert** is that it incorporates an excellent companion system which is the way all utility software, hence **Trilogy** and the **Trilogy loader**, means that no program takes longer than 50 seconds to load and the cartridge is competitively priced at £29.95.

Deciding on a cartridge system is not merely a case of weighing up the pros and cons of the disk and tape transfer. They are package deals and just as I prefer the **Expert** as my programmer's key partner, **Action Reply**, **Final** at **Freemove Machine**. The only way to decide now is to try the available ones, much you believe, and vote through the range of facilities on sale, how many you need and how many would not be used.

Flash Successors

The **Flash** system needed a chip change in the C64 and this seems to be the final one, many. All those of the big utility suppliers have a chip change system. **Datal's Professional 8025**, **Trilogy's Phoenix** and **Dorham Micro's Dolphin 8025**.

Much higher speeds can be achieved if the data is sent in parallel through the computer's video port. This means that in between can be exchanged between disk and computer at a rate of a frame instead of a bit at a time, in several instructions. Obviously this is about eight times faster but it does mean a new operating system has to be installed.

One last thing that all the systems seem to give over is that fitting these systems isn't child's play. They seem much more a C64 and in all but one case, the 8080 chips



were soldered directly onto the PCB. This makes a soldering job for most people.

Does anyone else find yourself asking you know what you're doing? The complexity and vulnerability of both the chip and the PCB trace is a tribute to the total designer. If a good heat sink is fitted the chip will be unacceptably damaged and if all of the solder is not removed, you could warp the pathways off the surface of the board and then you've got serious problems.

Given these two situations it's better to risk overheating the chip to ensure that the PCB is undamaged. I can fix serious problems soldering in the replacement IC which will be in time, ready to shed a leg when a drop falls in the main processor. The lesson I've learnt is not to settle for a cheap fix and thinking 'cheatily' isn't.

Using a solder sucker and a substantial heat sink I've removed many a 8086 without causing damage. I've had more problems soldering in the replacement IC which will be in time, ready to shed a leg than a drop falls in the main processor. The lesson I've learnt is not to settle for a cheap fix and thinking 'cheatily' isn't.

Once you've spent an hour or so soldering the board it's just as the job will just bring out a disk a few times, and usually requires no soldering. I hate!

Printron's DOS (includes an operating system called Disk System. It boots an independently loaded file of 60 files, faster than normal load. This means that a 30 block file loads in under 3 minutes (a transfer rate of over 150KB

bytes per minute or 125000 baud). I can't think of a frankly stupid. David could not supply me with a copy of Printron's DOS by the time that this magazine went to press but I can tell you, convinced of the reliability of this data transfer rate.

The use of the system's RAM seems to be much more moderate with program and sequential file save times 20 times the normal rate and a sequential file load 25 times lower than normal.

The system also adds thirty new commands to Basic, and includes a fast file copy. The Professional DOS costs £84.99 on the Cid or £69.99 for the C128/64 version.

Printron's DOS (loads a 240 block load in 7 seconds which is just under 30000 baud is a most pleasant rate than David's claim.

Trilogy, from that fall error checking has been retained which other systems have sacrificed in terms of speed. An additional 60 commands include those which allow the system to ignore write protect tabs. To do this the system checks disks can be checked simply by flipping the write-protect hole protecting.

At 12800 baud is just a cheap system and there is no C128 mode, version but it is 800 baud in line. Dolphin DOS runs through that it's probably the easiest for the new generation of better DOS chips. Having been around longer this system is one that I'm very familiar with and one slightly worrying factor is possibly a cause for concern with the Data and Trilogy systems as well.

Dolphin DOS seems to make the 4022 output chip more vulnerable than before and the recommended write-in procedure of Cid on and then P41 must be followed to every time the system is powered up. Through casual careless comments, I have succeeded in burning out this chip twice during the past year I've had the system running and a disk add just a bit to the cost of the system!

Cid is rewarded with a system which will load 200 blocks in less than 5 seconds (125000 baud) a save speed which is 12 times the normal rate for program and eight times for sequential files. Like the old Flash system there is also a full screen editor option.

The, no less monitor is a very hard, but useful utility and the single keypress

command character is learned most when in Basic, program step mode. Apart from this, only three extra Basic commands are added with Dolphin for you do get a free Dolphin Copy disk.

At 100000 it falls midway between the other two systems but does have a long and reliable track record to support claims to be the established standard utility for the C128/64 with P41 drive.

Trilogy have now gone as far as they can go. Any further increase in speed will definitely be at the expense of reliability and chip safety. The C128's early chips with its track and write really needs a full memory load faster than 1 second!

Touchline

Dart Electronics
Units 6/7
Derby Road
Potton Industrial Estate,
Potton
Snrke - via - Truro
Tel 0952 37983

Everham Motors
65 Bridge Street
Everham
Norfolk
NR11 4JF
Tel 0146 45589

IMP Computers UK
9 Harnham Way,
Wilton
Bristol
CB2 3EP
Tel 0756 34471

Supercell
Winchester House
Canning Road
Weymouth
Dorset
Dorset
DT4 7SU
Tel 01-464 1166

Trilogy
Dept PC 1
124 Tully Street
Bristol
BS4 6JY
Tel 074 494105



On-Line Line Up

Computer communications are a source of confusion to many people. We supply the key to modem living.

by David Janda

Going online with your Commodore may seem like a daunting task at first, but there's a fascinating world of computer communications waiting, which can be accessed with very little effort.

Purchasing the software to get going is no problem. Basically there are two types of package: videodata and terminal. Videodata software enables you to access services such as Muxnet and Physed which feature low-resolution colour graphics. Terminal software on the other hand simply offers plain text, but is still by far the most popular user interface in the world of online.

Your next step will be an RS232 interface to plug into the rear port of the C64. There is a large number of interfaces available, and you can pick one up for as little as £20.

Understandably the most difficult choice to make is which modem you should buy. This depends entirely on what you want to do. If, for example, you wish to subscribe to Muxnet 800 then all you'll need is a modem that can operate at 1200/75 — they'll even give you one free if you subscribe for a year. However, if you wish to access bulletin boards, and online databases such as Telecom Gold then the sky is your limit.

Various modems operate at various speeds. Generally speaking, the faster the operating speed of the modem the faster you can send or receive information. It's

also true that the faster the modem, the more expensive it is.

Of the modems that are currently on the market today there are three basic types:

Manual: these are quite simple and have to be operated manually by pressing buttons. They are also the cheapest.

Software-controlled: modems such as the Disaport are software controlled and, as the name suggests, they need the appropriate software to allow full access to the modem's features.

Intelligent: this type of modem is still quite rare in the home or small business market as they are very expensive indeed. Intelligent modems have their own set of commands and can be used fully autonomously.

We can now go on to look at a selection of modems that cover all three types.

VOYAGER 7

The Voyager 7 is a V21/V22 device which is suitable for use with Videodata and writing types of databases (DB). The baud rates available are 960/960, 1200/75, 24/240, and 1200/240(baud). A new mode allows the modem to be tested offline at 960 baud.

The Voyager 7 offers auto-dial and auto-answer as standard, but it should

be pointed out that the Voyager is not approved for auto-dialling and that the auto-answer option has been found to be very unreliable. Potential buyers are warned to test these facilities before making a purchase.

The modem is of average size, 160x160x30mm. Four rubber feet keep it from sliding around and an ample length of mains and PSTN cable are provided. A five-pin D-sub9 type (female) socket at the back is used to connect the Voyager to the Commodore Cartridge or RS232 interface, and a six-way rotary switch on the front panel is used for selecting the baud rate (request or answer) or the test mode.

Five coloured LEDs on the front indicate data flow, power, carrier detect and error. There is a lack of an on/off switch for an online telephone socket. The latter means that it will be necessary to purchase a splitter socket in order to use your phone on the same socket if you wish to avoid a lot of plug swapping.

The Voyager is a software controlled modem and is therefore best used with auto-dial and auto-answer software such as Muxnet, but the main problem with this modem is its reliability. As mentioned, the auto-dial feature is not approved by many people don't take any notice of this. However, the auto-answer facility cannot be guaranteed as Modern House, the now defunct company who



produced the Voyager series had problems with production. As a result Voyagers with a serial number less than 1200 will not auto-answer. However in time, Your Commodore has found that some Voyagers, with serial numbers higher than that have not auto-answered either.

Other aspects of the modem were fine and—taking the bugs into consideration, it does the job adequately. If you can pick up the Voyager 7 for around \$100 then you have a bargain, if the price is higher then look elsewhere.

NIGHTINGALE

The Pace Nightingale was one of the first reliable dual speed modems on the market. It has been available for a number of years and is now sold as the official Amimed modem.

The modem operates at 300/300 baud (transmit and receive), 1200/1200/1200 and 1200/1200 full duplex. The fully non-approved version also operated at 300/300 full duplex at full frequencies, which means that it could successfully be used in contact to American systems. The modem also features a 300/300 full off-line mode.

Three push buttons are situated on the front panel of the Nightingale. One

is marked modem select and is used to select the line once a carrier is detected. The second and third buttons select the speed and whether to use originate or answer mode.

Quite often non-approved models, an extra button was used to switch between U.S. Bell or European frequencies. This button was removed and covered with a plug to pass BAUF approved. The reason why U.S. Bell frequencies are not approved is because they cause havoc with RT test equipment.

Despite the BAUF approval it is possible to remove the plug and insert a push button (overseas U.S. Bell capability but this would void the warranty and upset BT).

Two six-colour LEDs on the front panel indicate carrier detection, full and powerline. At the rear of the modem is a covered RT socket that the phone plugs into, a pushbutton for selecting self-test and a five-pin RS421 (Dinamo socket) (Emake).

One other item of note is that there are plenty of ventilation grills on top and underneath the modem. Handy, as there is no need if switch and its easy to leave the modem plugged in.

The Nightingale is a manually operated modem and as such the transmit and answer facilities of any software used with it will not be of any use. Having said that it is perfectly

possible to use the Nightingale with packages such as Minitel, simply press the modem connect button when the carrier is heard and press the RETURN key on the computer.

An interesting non-documented feature of the Nightingale is that it will auto-answer when in answer Protocol mode i.e. 741200. This is achieved by setting the speed to 1200/300 and pushing the carrier detect button. After a few rings the modem will answer! It should be noted that this facility was not purposely designed.

Although the Nightingale is technologically rather old hat, it has the advantage of being a very, very reliable modem and although rather expensive when compared to low cost modems with many facilities, it can represent excellent value for money when purchased secondhand.

COMMODORE MODEM 60640

The Commodore Modem is also referred to as the Compuser Modem because it was designed to be used with that service.

Unfortunately Commodore don't manufacture the modem any more which is a shame as it is a very reliable device even though the specifications apparently belong to the past.



The Commodore Modem operates at two speeds only: 1200/75 and 1200/1200 half duplex mode as with the Designer modem. However, the 1200 half duplex mode as with the Designer modem has a very fast turnaround time and as such can be used with all the values of software that Y2 Computing produce.

The plus side to the Commodore modem is that it contains internal software on ROM specifically designed for connection to CompuNet. This firmware includes a 9600LP baud rate, a tone dialer and the ability to load and save software packages from external, the C64 when online (via the system on CompuNet).

Connecting to CompuNet is done by entering C with the shift key held down and then pressing RETURN. You will then be prompted to enter a phone number which the modem will auto-dial for you.

The modem is completely software driven and plugs into the C64's cartridge port. A telephone lead runs from the back of the modem but an external socket would have been very useful.

As with the modem it no longer is ghettoised and is designed for use with the CompuNet service does not limit it in any way that no user software can be obtained from CompuNet or Y2 Computing and one very pointed package is *Shakedown* which is available from Macromed 800. Also available from Macromed on disk or tape is the Mustang

software which gives the user access to Microsoft through the CompuNet network. All things considered the Commodore Modem is a very useful item that is ideal for novices. CompuNet and willing commercial applications (at 1200/75 baud of course) and is ideal for user-to-user purposes provided you have the right software. Although no longer in production these modems can be picked up secondhand for as little as £25.

DESIGNER

For those who are not satisfied with the current range of software-controlled modems, and yet do not want to spend a large sum of money on an intelligent model, the Designer modem from Dataphone could be just what you're looking for.

Dataphone have automated the process of many by combining elements of a manual modem with those of a software-controlled modem, added extra features and packaged it into a neat unit.

The Designer's on speed at 1200/75 originate, 75/1200 answer, 9600/9600 originate and answer and 1200/1200 half duplex. It's worth noting that the 1200 half duplex mode has a very fast turnaround time (under the 'Myager Enterprise or Nightquaker' which means the user-to-user and file transfer software supplied by Y2 Computing will be compatible with it).

The modem itself is very well

designed and has a low profile. The software-controlled aspect enables the modem to be used for auto-challing/answering. The Mustang software will do this with.

Another software controlled feature is the auto-band rate switching, but at the time of writing there was no 4 standard related software to make use of this feature. However, Dataphone are currently working in conjunction with a custom software house to rectify this situation.

The Designer can be completely controlled manually by using the five push button switches on the front panel. These switches are used to select the speed and to reset the modem into parity or stream mode. Two status switches introduce features not found on a modem of this price.

Firstly there is a power control switch and secondly there is a monitor control switch. The monitor allows you to hear the call in progress and is very handy for detecting a bad line. Six LEDs on the front panel also give you a full status readout of the modem.

One feature that is not available but welcome is the auto-band rate switch that suppresses the annoying beeps that modems like the Myager and Enterprise make when auto-challing.

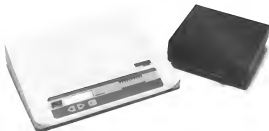
On the back of the Designer is a 25-way D-type RS232 connector (standard) and a received telephone socket. A telephone, length of telephone cable leads from the rear to connect the power cord which is fitted with a plug.

In use the Designer performed perfectly. The option of controlling it by software or manually is very handy and makes the Designer an extremely flexible unit. But by far its biggest asset is the price. For £99.95 (including VAT) it represents excellent value for money.

ENTERPRISE 1

The best way to describe the Enterprise 1 is to say that it's a Myager 7 with bits added on. Once operational and control are almost identical, this is not so surprising as both the Enterprise 1 and the Myager 7 were manufactured by Karl Ammann.

The Enterprise 1 is housed in a black casing with green lighting on the front



panel. A rotary switch on the right is used to select the required band rate which can be set at 300/1200 or 1200/2400. (2400/2400 full duplex, 1200/1200 half duplex). A button, not found on the Voyager 1 is the auto-off key button which is used when dialling/answering manually. An indicator is that when the button is pushed in the modem is off-hook and when it is out it is on-line. — the review would have seemed a more logical choice.

Situated at the top of the modem is the RS232C serial (female) phone socket, telephone lead and power cable. Of particular interest is the 21-pin RS232C connector which uses pins 1-6, 15, 17, 20, 22-23 and 24. Basically this means that connecting the Enterprise 1 to your Commodore should be no problem as a variety of wiring options is available.

The phone socket is covered in accordance with BT regulations, and this enables a telephone to be used in line with the modem thus saving you the expense of purchasing a double adaptor.

Using the Enterprise 1 is simplicity itself — even though the manual is set up to standard. When used with software such as Microbit from V2 Computing the auto-dial feature can be used. The Enterprise series employs technology to auto-dial which is easy to find in operation and not the more reliable method of putting a telephone to dial. One effect is that auto-dialling will cause any phone extensions to ring, which can be

annoying. This is a common fault in all software controlled modems.

One aspect of the Enterprise 1 is operation that is annoying is the auto-answer facility which is controlled by the terminal software. Auto-answer would only work providing that a three-way connection is being used. Personal purchases are, unfortunately, not used to test this facility before buying.

Despite this, all other aspects of the modem operation were fine, and I would conclude that if you are looking for a cheap but merely reliable modem with dual speed operation then it would be a good idea to shop around for an Enterprise 1.

SERIES FOUR

The Series Four range of modems from Pace Micro Technology consists of three models, and the most advanced was the 1200S which is a mid, mid-high, range.

What you get for the price is sophistication with simplicity. The Series Four is one of the new breed of intelligent modems. That is a lot of the work that is usually done by the RS232C interface software is done by the modem itself which has its own control program and control processing unit and is, in effect, a compact in its own right.

Control of the modem is achieved by sending commands from through the terminal software. These commands were developed by the Hayes Company and are

widely used throughout the industry.

The 1200S is a new model which operates at 300/600, 1200/1200, 2400/2400 full duplex. It features auto-dial, auto-answer, auto-based rate detection and selection. Also included is a battery backed, alarm clock and keypad which has the facility to store up to 64 phone numbers in its internal memory. The 1200S also features a full RS232C port with male, phone socket as well as a Commodore's printer port and 20 segment LED display with low strength mode and speed buffering is also incorporated enabling the modem to connect to a host at one speed while the terminal software is operating at another.

The modem itself is quite flat but takes up a lot of space. The front panel consists of an LCD display with two push-sensitive buttons that are used to manually select expansion pins for 1m, status and low strength LEDs. At the rear of the modem is the socket for the external power supply and the antenna, socket the Commodore's port and a reset switch.

Once connected to the main, the 1200S is easy to operate. Due to the way the modem is wired up to the main, the communications software will think that the modem is online, and as no terminal mode. The reason for this is that the commands, to operate, the modem are entered from the keyboard while in terminal mode. It understands this better outside the following example:



You would like to connect Telecomm Gold at 1200 baud full duplex even though your software does not have a 1200 full or half duplex mode.

Part of all a speed must be selected from the software menu. Although you want 1200 baud eventually the choice is purely arbitrary such as 300/300 baud just so that you can go online. Even though you aren't connected to a host at this point the modem runs the software and thinking that it is.

At this stage you are greeted with a blank screen but by pressing **ALT** the Screen Four **HELP** screen is displayed (Table 2). Browsing with Telecomm Gold at 1200 full duplex you would simply enter the following:

4750 880 1200

This now will happen automatically with the modem dialing, detecting the carrier, selecting the appropriate baud rate and so on. Even though the terminal window still only operates at 300/300 baud it's possible to use services that operate at 1200 baud full-duplex because of the Screen Four's internal memory buffer keeping things in check. The net result of this is that the modem is exceptionally easy to use but extremely powerful at the same time.

TABLE 1 - Screen Four ALT Command Set

- A Answer call without delay
- C Carrier control (C30OFF C30ON)
- D Dial number and originate call
- E Echo commands (E00OFF E00ON)
- F Echo done (F00ON F00OFF)
- H Hook control (H00ON H00OFF)
- h Update history (u01 2)
- Ka1 Display/set mode/bits (a01L2)
- La Speaker Loudness (a1 2 3)
- Ma Modem status (a01 2)
- Na Display/set number sleep
- O Go back on-line
- P Pulse dialling ON
- Q Reset code (q00ON/q00OFF)
- R Resume to answer after dialling
- Sa Display/set speed
- T Tone dialling ON
- Ua Unattended mode (u00OFF u00ON)
- V Re-call v000
- (V)Name (V)alphabetic
- W Wait for secondary dial tone
- Xa Extended-call code (a00 2,3,4)
- Z Resets S register/command
- NOTE: T indicates address to the standard Hayes command set

MULTIMODEM (C64)

The Multimodem from Mitya (4)

Technology is a combination of hardware and software in one package. If you are looking for a modem that can be used for videodata as well as terminal applications then this could be what you're looking for.

The modem operates at 1200/75, 1200/300, 300/300 sender and receiver and at 1200 half duplex. A 300/300 baud full duplex mode is also available for full lines. Other hardware features include auto-dial and answer (which are controlled by the software) and a very fast turnaround time when using the modem at 1200 half duplex.

TE Computing have written a number of programs including screen-on-screen and enhanced 40 column packages. These require modems that have a very fast turnaround time and the Multimodem could fit the bill.

The Multimodem lacks buttons and switches because it's completely software driven. It plugs into the C64 cartridge port and has a telephone cable coming from it which plugs into a standard telephone socket. No telephone socket is supplied on the modem itself so it will be necessary to purchase a splitter if you wish to use a telephone on the same line.

Using the Multimodem via its screen-driven software is very simple and the combination is a nice one, leaving you the option of buying other packages such as VT's file transfer package.

PRISM 2000

If you subscribe to Muxnet for one year and pay in advance, they will give you the Muxnet, videodata and terminal videodata (modem or tape) and a Prism 2000 modem free of charge.

The modem is no longer being manufactured but was one of the first to be approved for use at 1200/75 baud. Two speeds are available, 1200/75 (for use with Prism/Muxnet) and 1200/1200 full duplex. The half duplex mode is a link, activated by one, requiring you to manually switch from send to receive by pressing a button. The modem has software to be loaded around by software control and details are given in the manual.

The Prism 2000 is good for accessing the videodata services for which it was designed.

Fresh Chips

With the Power IV chip you can improve the quality of the copy you get from your MPS 801 printer.

Abstract

One of the biggest drawbacks of the MIPS III processor is the lack of true decoders. There have been many programs written to overcome this problem. There have also been many top quality programs written which provide the user with the option of many different font styles. (Note: Mentor is not one which springs to mind.) All these programs have one thing in common. As software, the user has first to go through the process of loading in the program then selecting a given font from a menu before setting any variables such as font

Power 8[™] on the other hand has none of these drawbacks, as hardware over the chip has been installed so you just flip a switch and turn it on. The selected feed is now ready to go.

Filling the clip is simply stuff, hourly work and three puns, and I am hopeless with directions. Instructions by James Bond 44 are as follows:

- 1) Disconnect the printer from the Master. Remove the paper from cover paper shell and load handle.
- 2) Using a cross-head screwdriver, move the lower frame backing the original housing, and the lower housing together. Lift the top flap to expose the tape holding the character. Lift and remove the tape to the rear of the printer. Using a flat-head screwdriver, carefully lift out the original character. (ROM chip data is a 32 pin chip)
- 3) Take careful note of the position of the chip as a small notch at one end.
- 4) Take the *Proton IV* character chip together with adapter and fit this into the carrier that housed the original chip (taking note of the position of the notch on the chip which should align

most cases, by using the angle of the greater looking from the front. The fly lead with the longer legs can be placed to run if I have drilled a small hole in the top of the jumping thread, if it goes through and it is now permanently secured.

4 Re-attach the printer and you are ready to use your new database sets. **CAUTION** Opening the printer will invalidate your warranty if it is still in force at the time.

There are four character sets available for use:

- 1. [Differences between...](#)
- 2. [Tag training](#)
- 3. [Differences in...](#)

1000

When using a word processor it is advisable to use a paste command before inserting between character codes.

It is undesirable to switch between sets while the printer is actually printing. This will cause corrupted characters, and will also result in a blank line inside the printer.

I would also advise that you put the original ROM chips safely away somewhere.

For anyone who uses their printer often this clip is a must. It's quick and easy to use and the real results are impressive.

A		B	
100	100	100	100
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196	196	196	196
197	197	197	197
198	198	198	198
199	199	199	199

Net Benefits

What are networks and bulletin boards all about? We leave no stone unturned as we engage in communications.

by David Janda

When you get your first modem you must face the problem: who can you call? The two most commonly known Computer and Modem magazines require a subscription privilege if you want to get more than just a few free articles. Is it worth the money, or is it best to wait for the bulletin board circuit?

MICRONET

Micronet 800 started ages much older than you. The service is an information provider (BBS) operated on the Prodigy database. Subscribing to Micronet not only provides the user with access to Micronet itself, but also access to the rest of the Prodigy database. Furthermore, you can register as an individual user for free which provides a gateway to Telelink Gold and all of its services.

The structure of Micronet is fairly simple. Pages of information are filed through a numbering system. The 34 pages are displayed on the TV or monitor. Each frame can incorporate color and low resolution graphics.

All frames are numbered and you can find the majority of frames in Micronet are free to subscribers, but some services demand a charge which is displayed at the top right-hand corner of the frame.

Manipulating frames is done the way it always has been on one of three ways. First, providing you know the specific page number you want to look at you can enter an override followed by the



page number and this will take you directly to that page. Secondly, keyword searching enables you to enter a name associated with a particular page. For example, to get to the front page of the Shadow adventure game simply enter 'SHADES'. This is by far the best way to move about Micronet. Thirdly, pages will often have messages along the lines of 'Press 1 for more'. Pressing one will get you to the next page. This option is especially useful in those cases to the service.

Micronet really caters to the BBS, mainframe, Commodore 64 and ZX Spectrum, each of which has a monthly dedicated text. These microbases can be considered as mini-databases within Micronet. A microbase has its own features and devices which are supplied by the editorial staff. Each area also has a short group system with articles and features supplied by editorial staff and subscribers alike.

Some of the features found on Micronet include the news page. Many

Mouse, Barnet, Sunday Xtra and Charlie. The news is updated daily with the latest microcomputer news. Contents can be browsed via Mouse Mouse which is actually an item edited by Steve Gold who passed away just the other day of Huntington Park a few years back.

Barnet even contains Macintosh which is not more related but is aimed at the small business user providing business on software such as tax and insurance.

Amiga Fun - this is related area is Sunday Xtra which has film and record reviews plus a gossip column all presented in a magazine format.

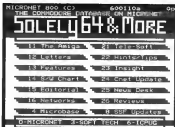
A Minitime Chatting service allows subscribers to talk to each other on a public type of bulletin board. Messages are updated instantly whenever a bulletin are provided, each dedicated to a specific area of interest. A California chatting is held each week where a special guest answers questions put by subscribers. Subscribers can also look through a special gallery area and use them to start their own mini-magazines.

A major part of Micronet is the Telewindow area. This window software that can be downloaded into the mouse and speed to disk or tape. Common call subscribers and free software is provided for where there is a charge the user is always informed of the price before downloading.

COMPUTNET

Computnet has been in service for the past three years and was developed to interface with the Cid user. What now the service was exclusively for Commodore 64 users but there are future plans to cater to other types of hosts. The first being the Amiga. Because Computnet is geared towards the C64 user, the database is much more flexible and can take full advantage of the Commodore machine. This is the biggest advantage of a dedicated system.

The database is organized in a series of directories arranged with a tree-like structure. Each directory can contain one or more entry which may be title, a program or a further more detailed directory. Each directory follows a common format. This includes the subring which defines the sub-directory



which part of the database they are currently accessing. This index consists of a name and a directory reference number.

Entries also contain a standard set of information. This includes the page number, name, type of entry, program list, date, price list, age, file in system or date, author and a note.

Extracting the database and saving commands are very easy. The bottom line of the display forms what is called a database menu. This can be scrolled from left to right until a command is entered. Through these commands the subscriber is able to upload, download, view the contents of a directory entry, move documents, mail and so on.

To call up a directory entry it is first necessary to move a blue bar over the entry using the cursor keys. If it is a list entry, the SHIF command on the database will cause the contents of the entry to be displayed in Cid text mode. If on the other hand it is a program it can be downloaded straight into disk.

Moving about Computnet can be done in three ways. First by going directly to an entry with the GOTO command followed by a page number or name. Secondly by using the DIR command to go further down the tree, or by using the BACK command to go higher up. Thirdly, frequently used areas can be accessed by pressing one of the Cid

function keys.

The contents of Computnet are mainly supplied by the users themselves. Computnet depicts the structure of the database and provide many services such as the Current releases and service guidelines, Multi-User Games (MUGs) and so on.

Many of the top Commodore software producers sell their software via Computnet at reduced prices. A service called party-line enables real-time chatting between individuals or groups. Another very popular area is the advertising panel area which features MUD and FEDERATION.

By far the biggest attraction to Computnet is an area of the database called the bangle. This area can be used by the subscriber as a mailing list, one which they can upload and distribute their own programs to (or if other users, may then access it by the removal creating that this system). Another feature is a number of useful programs including information, club news, free software and so on.

Another very powerful aspect of Computnet is that facilities can easily be added. Any changes to the system that would normally require modification of the host's programs, are still made in an easy way as a software patch can be downloaded onto the C64 in either native or binary format.

MICROLINK/TELECOM GOLD

For the past four years British Telecom has operated an electronic mail service called Telecom Gold. It's a service aimed officially at the business user but in reality it's far more than that.

BT Gold can be accessed by any means: modem and terminal software combinations with a spell facility. Further, it can be accessed at a variety of speeds: from 300/600 full duplex to 1200/1200 full duplex. It can also be accessed from ISDN which is BT's high speed data network.

At first sight BT Gold seems daunting yet it's really quite simple to use. Unlike Microsoft's ProMail and Compuserve, BT Gold is operated by using a number of commands.

The facilities provided by BT Gold are tailored for the business user. Each subscriber has a mailbox, can send and receive electronic mail to and from other subscribers, be they in the UK, or anywhere in the world with a Telecom system in operation. Teleconferencing is also provided as well as a number of games, and business programs such as spelling checkers, statistical tools, and databases.

Help is always at hand with the HELP and INFO commands. Even from within a program (such as the first edition) help can be sought by entering 0.

BT Gold is split into a number of systems that subscribers can still communicate with each other regardless of the system they are using. One such system (TJ) is called Microlink and is operated by Database Publications.

A subscriber to Microlink has all the facilities of a Gold user and plenty more. Microlink has a menu driven front end to BT Gold which is very user friendly. Microlink also provides a number of enhanced services such as a bulletin board information service, regular mail news, newswires, text for Commodore macros, thoughts, and gateway into other computer databases.

One such gateway is to the Microbase service in the USA. Microbase is a database which offers multi-user games, software (for the Commodore), special interest groups, real-time chat and so on. It's rather

expensive to use at 25p a minute, but far cheaper than dialling the States direct.

Subscribing to Microlink is by far the best way to gain access to BT Gold. This is due to a number of reasons. Firstly there are the added facilities that Microlink provide. Secondly Microlink has a monthly subscription fee of £3 which is quite cheap considering that normal BT Gold subscribers have to pay £5. Thirdly because Microlink can be used both as a serious business tool and for entertainment of which there is plenty.

BULLETIN BOARDS

A bulletin board (BB) can best be compared to a community notice board. BBs are usually run by hobbyists in their own spare time on a home micro equipped with a disk drive and an

auto-answer modem.

Typically, BBs will allow one user at a time to browse through the files stored on the board. These can include messages from other users, general information, operational systems, downloadable software and so on.

Compared to Microbase or Compuserve, BBs are not technically brilliant, but they are by no means a joke. One of the best things about using different BBs is that they're not homogeneous, artificial or run by money makers — and that makes a difference.

The UK currently has over 200 BBs that operate at regular times, and this number is growing. Basically there are two types of BB in vogue here. There is the traditional scrolling type of BB and those using the Videodata standard.

In screen scrolling BBs you'll need terminal emulation software to see what

MICRONET (c)

WELCOME TO MICR

INTERLINK

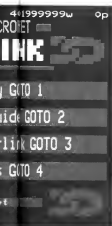
Interlink Gateway (T

Interlink User Guic

How To Join Interlik

Interlink Charges (T

9: Micronet



terminal) software. Most online packages include the type of facility but since you are a Viewdata (FidoNet) user who doesn't have this facility, there are lots of public domain (free) terminal programs available from user groups such as EPLUG or CLUG. Terminal software does not give you any colors or graphics but it does allow you to login to some types of BBS.

The second type of BB operates using the Viewdata (Proview) standard which provides information with colors and low-res graphics on a page format. Microsoft Proview subscribers will not need to buy any additional software, but CompuLink users will need the free Viewdata program which can be obtained through the system. Again, as with the dumb terminal software, most commercial online software has a Viewdata mode.

Most BBS are operated at 300 baud. This means that you'll need a modem such as the Designer Nightingale or Modemcon from Micro Technology. All three will also allow you to access boards at 1200/75 in Proview and scrolling format. CBM4 Modem owners need not feel hard done by because many boards now allow access at 1200/75 baud and some even operate at 1200/200.

Logging On

Each BB has its own unique style and character. Features common to all types of BB include an E-Mail (Electronic Mail) option which enables you to send and receive messages. These messages can be sent privately to another user or be posted on the general board for everyone to see. Other features on BBS typically include free downloadable software.

Downloading can be achieved in several ways but by far the most popular system is the X-Modem format. In your computer package should have this system. Don't worry too much if it doesn't support X-Modem, as most BBS can transmit the software in ASCII or RETAS/BBS format.

Another common feature to be found on BBS are SIGs - Special Interest Groups. These are areas which contain information on one particular subject

such as a specific music system, in general politics or whatever the SIG operator wants.

There are a few BBS running on Commodore machines, typically Amiga. You can set up and run your own BB with Amiga's BB public domain software or by buying the BB Host software for the C64 from IC Computing for \$69.

When using a BB it's worth remembering that the quality of a bulletin board is governed by its contents. The software and messages are all supplied by the users in the first place so don't be a parasite as well as downloading programs and sending messages, why not put some up as well?

BBS To See

The table details a very small selection of BBS that are currently in operation on a 24 hour basis.

Users state that you will need Proview style software to access the board. 1200 means that you'll need scrolling software and a 1200/75 option modem such as the one from Commodore to gain access to the service. 300 means 300-300 baud access which needs scrolling software. CBM4 Modem users will not be able to access this type of board.

Name	Telephone	Rate
BBS 1	0944 276306	300
Bascom File	08 779 6053	View
Canthill Elec	0333 464325	View
C-view	0902 346771	View
DATADES Dublin 2	0089 839634	300/1200
Proview, Lar 2	08-502 4543	300/1200
PRBA Statistics	0991 207993	300
Gomez at Home	08-888 8394	View
Gensel AMBS 2	0572 626134	300/1200
Hackney BB	08-989 1322	View
Hampshire Thunder	0752 346899	300
Interimage 2	0089 764642	300/1200
LARBS London 2	0887 844664	300/1200
Lightfingers, Place 2	0202 465723	300/1200
Levensham BBS	050 638726	300
London BB	08-416 6607	300/1200
London Underground	08-467 0668	300/1200
Mosell	01-341 1799	300
Moffres - 80 (Liverpool)	054-428 8834	300/1200
Motomil	01-741 4285	View
NX ARBS 2	0956 842714	300
Noricos	0668 2046	View
TRBS (Blasted)	0298 94494	300

BBSes marked with an asterisk are either run by Commodore machines or have a MGA for Commodore owners.

RS232

Many people switch off when they hear the mention of the RS232 interface and related subjects. This article is aimed at clearing up some confusion and doubts.

By Steve Carrie

Some (if not most) of you will have heard by now all that fuss about all computer industry subjects: the RS232 communications standard. People have been known to go weak at the knees and faint when it is mentioned. There are, it causes problems for computer registers controlling up equipment such as printers and modems. It has even given rise to a lucrative business of building the so-called "break-out boxes" for monitoring and "tuning" RS232 lines.

If it is supposed to be an industry standard, why does it cause so much hassle? Every computer manufacturer has different ideas on how to build a computer which devices to go, how big the screen should be, etc. It would seem that this state of thought also includes the RS232 standard.

Now, before I go on let me say that the idea behind RS232 is great. A standard interface for connecting different types of hardware (including computers) together. RS232 is well-suited to the field of telecommunications. Modems are usually connected to a computer via an RS232 link. You can connect two computers together and transfer programs between them (a technique often called "porting").

Unfortunately, things are not so simple. With different manufacturers having different ideas on how to implement the standard (Commodore is no exception) a great deal of confusion exists as to when two pieces of hardware

are to be connected together. Most of the confusion surrounds the way in which the control lines of an RS232 should be used. Thankfully, this does not concern us in this article since we will be using only a basic RS232 interface.

Basic RS232

As you may know, RS232 uses the serial method of data transmission. Information is sent bit by bit along a single wire to a receiving machine. Some data may flow in both directions: one wire plus a common return are required to make a basic RS232 communication line. The lines are usually connected to equipment by a 25-way D-type connector. Data leaving a computer flows via pin two and incoming data enters via pin three. The D-type is connected to pins seven. This gives the "3-line" RS232 interface. There is no control over the flow of the data in either direction unless handled by the software, (more on this later). An RS232 interface using more than three lines flows in

known as an "N-line" interface.

It is best to use a three or four core cable with a shield (we will see why in a moment) rather than separate wires.

For the purposes of this article, this is all we require. (Ah yes, you say, "but it's all very well, but, isn't Commodore doesn't have a 25-way D-type connector but does any RS232 interface?" True it doesn't have a 25-way connector but it does have an RS232 interface. You mean you didn't know?")

Commodore RS232

Since the time of the Vic 20, Commodore has "programmed" its limited form of RS232 port. I say programmed because the hardware device normally associated with RS232 communications, the Universal Asynchronous Receiver/Transmitter (UART) is not present in the circuitry of the Vic 20. So, 64C C128 and C128D. The circuitry of the C16 and Plus/4 is identical. The C16 cannot handle RS232 communications (we shall see why in a moment). The Plus/4, on the other

3-LINE RS232C VOLTAGE

pin
2
3
7

CONNECTIONS (25-way D-connector)

Signal	
Transmitted data	Send
Received data	Yes
Common (GND)	Grid

load is normal for a different reason. The machine DMS has a UART.

RS232 signals appear at the user port. This accounts for the response to the SDB command RS232. It does not have a user port (a strange convenience). Attronix knows why. All the software is handled by the Operating System (kernel). This (except in the case of the Pico40) the user port coupled with the Kernel becomes almost the equivalent of the RS232 UART (the 6851 with the caveat that the software is supposed to simulate).

In the Yu, the user port is con-

trolled by a Versatile Interface Adapter (VIA). In the other machines, a Compact Interface Adapter (CIA) is used (but a lot of difference as far as this article is concerned). Now before some old-timey and look at the mention of VIAs and CIAs let me say that (thankfully) we do not have to program these devices directly. The Kernel handles all of the RS232 associated programming.

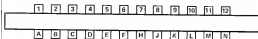
Figure 1 shows the RS232 associated connections to the port looking from the rear of the machine. Note that the user port uses a D-25* edge connector (available from

Maple under number 86746). The top row of terminals are identified with numbers, while the bottom row terminals are identified with letters. This means that it is very easy to connect the socket the wrong way up which could have disastrous consequences for your computer. The correct way is with the letters in the bottom as shown.

Connecting Up

The terminals labelled Send (transmitted data) and 'em (received data) and GND (G's common) are the three

RS232 LINES FROM THE USER PORT



Pin ID	Description	Abbreviation
C	Received data	Sn
D	Request to send	RTS *
E	Data terminal rdy	DTR *
H	Received line sig	RCD *
K	Clear to send	CTS *
L	Data set ready	DSR *
M	Transmitted data	Send
B	Received data	Sn
A	Protective ground	GND
N	Signal ground	GND

2 +5V supply

*These lines are not used in 2 line mode

Signal ground is the Common return
Protective ground for screening.

Maximum of 100mA may be drawn from
the +5V supply

Fig 1

lines we need. Now, here's one that there are 1940 commands labelled Sin. The reason for this has to do with the way in which the RS232 on these machines works. One of the Sin lines is for data, the other is a flag or trigger signal. Because the Commodore RS232 relies on Non-Maskable Interrupts (NMI) or interrupt requests (IRQ) in the case of the Plus/4, there must be some form of disconnect to let the system know when data is being received.

When data is being received over the Sin line, the voltage level on this pin changes rapidly, causing messages to occur. The system software collects the data on the Sin line, placing it in an area of memory called the Receive Buffer. There is also a Transmit buffer for outgoing data. Thus the reception and transmission of data is basically transparent to the user. However, this method has its problems as we will see. The practical aspect of all this is that BOTH Sin terminals must be connected to the Sin line. Since they are next to one another, there is great potential for problems.

Also note the connection called PROTECTIVE GROUND. This terminal should be connected to the shield of your cable if you suspect any outside electrical interference or causing data errors.

While on the subject of making connections, you will have to use a soldering iron. Now don't run and hide (gasp) if you are not too sure about handling one get an electronics hobbyist friend to do it for you.

It should go without saying that YOU SHOULD NEVER MAKE CONNECTIONS TO THE SOCKET WHILE IT IS CONNECTED TO THE COMPUTER. Always disconnect the socket BEFORE making or changing any connections and NEVER connect the socket to a live machine. ALWAYS switch off the power BEFORE plugging or unplugging!

OK. So you've connected your socket up and plugged it in the correct way - what now? If you only want to communicate with another Commodore (Vice, C64, Plus/4 or C128) then there is no great problem. The only thing to watch is that you

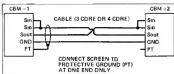


Fig 1

must estimate the flow of one machine to the Sin of the other as in Figure 2 in order for them to exchange data a lot (almost daily).

Commodore connections

If you don't intend connecting your machine to anything other than another Commodore, you can skip the rest for all together and get on with the programming. If you have a friend with one of the machines mentioned you will be able to type messages to one another. Inside a year you'll meet door and you have a long piece of 3-core cable - your own mininetwork! (Not recommended if you live across the street or several houses away!) How far you will be able to keep the machines apart depends very much on the operating conditions. Electrical interference may cause errors and there will arise a point where the line is just too long. It's best to experiment with what you've got.

Non-Commodore Connections

This is where things get tricky. Connecting to anything other than a similarly equipped Commodore has its problems. This is because normal RS232 requires logic levels -12v logic 0 and +12v logic 1 as opposed to the Commodore RS232 logic levels of 0v logic 0 and +5v logic 1. (Note that on a micro-print RS232 logic is opposite voltage level-wise to your Commodore.) However this problem can be overcome quite easily. There are various logic drivers available specifically for this purpose. Among

these are the RS422 line driver 1441 and RS423 line receiver 41LS123N. These devices convert between TTL logic levels and RS422 logic levels. RS423 is another (current) standard which is compatible with RS232 (at least to a certain extent). The beauty of using these devices is that they will operate from a +5v/+5v supply. This means that the user port +5v output (pin 2, see Figure 1) may be used for the +5v supply and all that is required is a -5v supply. These are the devices used by the BBC micro for its RS423 port. Figure 3 shows the circuit required.

I can hear the groans of discontent "I can't do that! I've never built an electronic circuit before!" If you do have an electronics hobbyist friend try building his/her own building a kit for 100.

I will not go into detail over the construction of the interface. I will assume that if you are building this you know what you are doing. The 541,500 device is used here as a logic inverter. I suggest that you wire it, switch it on and not to subject the device to heat which could damage them.

Power Supplies

If you plan to use the more (officially) power supply circuit shown in Figure 4, I suggest that you use both the +5v and -5v supply circuits so as not to rely too much on the already overstressed computer power supply. If you without saying that no-one should use the means unless they do know EXACTLY what they are doing.

The alternative battery supply cir-

	7	6	5	4	3	2	1	0
	P	P	P	D	T	T	R	H
P	Parity			D		Data		H
T	Transmit control			R				
FFF	D			H (non-PLUSA)			H (PLUSA)	
00 Disabled	1 Fail			01 Idle			0 Recover on	
001 Odd	1 Half			1 8-line			1 Recover off	
01 Even								
01 Mark (U)								
111 Space (0)								
TT 4Pin/4 only					R (Pin/4 only)			
00 IRQ Disabled, RTS=1, TX off					0 IRQ on			
01 IRQ Disabled, RTS=0, TX On					1 IRQ off			
10 IRQ Disabled, RTS=0, TX On								
11 IRQ Disabled, RTS=0, RX								

Age Group	Percentage of Respondents
18-24	85%
25-34	75%
35-44	65%
45-54	55%
55-64	45%
65-74	35%
75-84	25%
85+	15%

Figures users should refer to pages 287-311 of the user manual for further details on their machine's RESUME capabilities. This machine can handle standard rates of up to 18750 baud.

Handshaker derivatives have the interface well-specified. We will be using Scheme. Scheme is where you are using control lines, as well as the data lines. This makes things a bit complex so we will stick to Scheme.

Duplex should be set to Full. This determines how the receive and transmit will behave.

Parity is a kind of error check. When data is recovered, the system checks it bit by bit to agree with the parity. If not, the parity error bit in the variable ST (status) is set indicating some sort of error. There has always been a way to set the type of parity check requested. Of course, both machines should be set to the same parity. In most cases, parity is not used and error checking is done in a different way (not on this issue).

This may seem a little complex, but it isn't really. Let's suppose that we want to open an RS-232 channel to an AT80C based, eight data bits, one stop bit, no parity. The OPEN statement would be

OPEN 2.2.0.CH08C24=C08042
(non-Plus4)
OPEN 2.2.0.CH08C24=C08045
(Plus4)

and that's that? Simple, eh? In fact, if you stick to the particular format of eight data bits and no parity, you can't really go wrong. Just change the baud rate to suit.

Incidentally, the Commodore 64 programmers reference Guide tells you that the comma and register character is NOT required. It's probably safer to leave it in. My C128 sometimes won't work without it.

Using PRINT HANDGETS we can write a fairly simple terminal program running at IBM speed. Running this on two machines (assuming a two Commodore) you will be able to type in a message on one keyboard and see it appear on the other machines display, as well as your own. Figure 7 shows the program while Figure 8 shows a similar program for an IBM compatible machine, running PC DOS or MSDOS and C-RAWASM!

It appears that the Commission's findings, which are the subject of the present report, are in line with the Commission's previous findings.

```

100 COPY N = 2 DO C=100%[4]+C100%[4]
110 IF M=PL1$A C100%[5] THEN COPY N
200 DO C=100%[4]+C100%[4]
300 PRINT "[4] L5"
500 GOTO 100 AS
600 IF A=0 THEN THEN PRINT AS
500 GOTO 100
600 IF A=0 THEN THEN PRINT
650 PRINT 100 AS
END

```

Figure 2. *G. trichosporus* under horizontal stress.

```

10 OPEN "C:\MSDOS\BIOS" AS #1
20 CLS
30 DO LOC=10000 UNTIL SO
40 AS=INSTR(LOC,11)PRINT AS
50 IN=INSTR(AS,11)
60 IF IN<>" " THEN PRINT
70 PRINT:LOC=LOC+1
80 GOTO 30

```

Both programs check first for a character from the F5-212 port. If one is found it is output to the screen. If not, the program checks for a keyboard input. If found the character is sent to the screen and also to the `FILE`.

Another interesting experiment when using an IBM compatible machine is to make the following change to the main control program on the Controller.

DOI: 10.1002/for

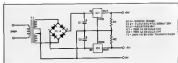


Figure 1

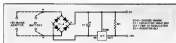


Fig 5



Fig 6

and run it. Now type the following on the IBM while in DOS:

```
MODE COM1:200 N 8 1
CITY COM1
```

(MODE is a normal no-disk containing the command must be in the default disk).

This causes the IBM to think that its input/output device is the RS232C port instead of the console. This has the very odd effect of making the Commodore control the IBM[®] (although the character sets are different and some odd graphics characters may be printed). To return control to the IBM console, you must type CTTY CON on the Commodore.

Obviously, not many of you have access to an IBM, but this experiment does show up one very important problem with the Commodore's 3-line RS232C interface. If you take control of the IBM using the CTTY COM1 command again and type DMR which is the MBOCOP command to display the directory, the first few lines are printed normally and then suddenly there is a whole lot of garbage. If you slow down the baud rates to say 300 the problem may disappear. Why does this happen? Remember what I said about the Receive buffer? Well what happens is that data is received transparently over the RS232C lines and placed in the buffer. The buffer fills up quicker than basic can empty it with the result that

the buffer overflows and data is lost. Buffer overflow can be detected by examining the SI status variable (but Data is just too slow and you may still lose data).

Solutions

1. Use a slower baud rate to let basic keep up.
2. Develop some form of software data flow control.
3. Connect control lines up and use an x-bus interface.
4. Use machine code to process RS232C data.

Option 1 is not a good idea. Anyone who has used an RS232C link at 300 baud will know why (yawn!).

Option 2 is better but requires programming which we will discuss later when we discuss file transfer.

Option 3 is not really practical here.

Option 4 is probably the best solution in this case. Data can be removed from the buffer much faster using machine code and this will be fine for the speeds at which we will be working (up to 1200 baud).

A V01, short machine code program can be written to handle the RS232C interface. The routine that follows is given in the form of a Basic loader. Change the variable AD to any

free area in your computer's memory (the tape buffer is a good place). This program is for a C128 but it should work on any of the Commodore machines discussed.

```
10 OPEN 2,6:CHR$(30)+CHR$(6)
20 REM FLUSH USER'S OPEN
30 2,6:CHR$(30)+CHR$(3)
40 AD=306:CA=AD
50 READ BY
60 IF BY =1 THEN POKE
AD:AD=AD+1:GOTO 30
70
80
90
100 DATA 62,2,12,16,25,12,28,25
110 DATA 12,24,25,15,24,1,2,28
120 DATA 12,28,25,24,25,12
130 DATA 25,25,16,2,24,25
140 DATA 25,5,17,2,17,1
```

The only way out of this program is a RUN/STOP/RESET. Table 1 is the disassembled code with comments (addresses may differ from your version).

The program uses the kernel portable routines it should be valid for all of the machines.

After the machine code has been placed in memory, the RS232C channel is opened with a file number of 2 (file channel number). If you change this you must change the two LDN instructions in the code and the machine code routine called. Now the RS232C receive buffer does not get a chance to fill up on no data input. The OPEN statement could be replaced by the code in Table 4.

Character set translation

All this should be fine for Commodore

0800 LDX #00	Make channel 2 the current input device
0802 JSR \$FFFC	
0804 JSR \$FFFC	Scan the RS232 buffer for 1 character
0806 TAY	Save data
0808 JSR \$FFFC	Clear the channel
080C TTA	Restore the data
080E BEQ \$0812	If data is a null (in zero byte) then skip
080F JSR \$FFFC	Output valid character
0812 JSR \$FFFC	Check for keyboard input
0815 BEQ \$0800	If none then recheck RS232
0817 PLA, Save data	
0818 LDX #00	Make channel 2 the current output device
081A JSR \$FFFC	
081D PLA	Restore data
081E JSR \$FFFC	Send byte to RS232
0821 JSR \$FFFC	Close channel
0824 SEC	Force loop to check RS232 input
0825 BCS \$080D	

Table 3

LDA #00	Channel 2
LDX #00	Device 2
LDY #00	Secondary Addr. 0
JSR \$FFFA	Set Input file
LDA #01	2 char. in filename
LDX # NAME	Pointer to filename
LDY # NAME	Pointer to filename
JSR \$FFFD	Set filename
JSR \$FFFC	Open RS232
Begin code	
NAME:00 240 ; Control and command register values (PLUS 4—	
NAME:00 240) (06 is the byte denoting of my C64 and C128	
assemblies)	

Table 4

to Commodore communications. It will also work with Commodore to IBM/ASIC and others but can yield strange results, the reason being that the Commodore's do not use standard ASCII codes. They use what is sometimes called PETSCII. On Commodore PET being the first to use it. The most noticeable effect of this is that certain characters will appear on the Commodore's screen as graphics characters. The solution to this is to insert some form of translation table or routine into the code. Since data flows two ways, a routine of tables would be required for each of input and output.

Two translation tables, each of 256 bytes, are required to handle outgoing and incoming data translations. The following program builds the translation tables and the machine

code into memory starting at address A/D. It needs at least 600 bytes to operate in so you need only change A/D to the address you require. This routine is for the C128 (Program Translator).

Program Translator

Lines 5 A/D=start address.
 RE=Command reg. CH=command reg.
 Lines 10-100 Prepare tables
 Lines 110-115 Setup name of channel (register usage)
 Lines 120-150 PORE error table
 Lines 170-200 PORE transmit table
 Lines 210-230 PORE code to memory
 Lines 240-275 Adjust table references in code
 Lines 280-295 Adjust register usage references in code
 Lines 300-330 Select lowercase and call routine
 Lines 340-370 Code data

Table 3 shows the disassembled machine code (addresses are offsets from the start address).

Basically, the operation is the same as before except:

1. The channel is opened from machine code.
2. Characters sent and received are translated.

Note that the backslash (\) character received will be displayed as a pound sign. The IBM Character does not have a backslash.

Transferring files via RS232

This is probably the most useful application of RS232 transferring data between unlike machines. It is possible to transfer programs between two entirely different machines.

When using a 3-line interface it is necessary to introduce some form of protocol into the software at both ends. This means that each machine understands exactly what the other intends to do.

A typical protocol exchange would look like a conversation between the two machines:

```
machine 1: Are you there?
machine 2: Yes
machine 1: Requesting data transfer
machine 2: OK
machine 1: Transferring data (block of data sent)
machine 2: Received data
```

and so on. The "are you there" "yes" etc messages are actually 1 byte control codes. Normal ASCII has 12 control codes (codes 0-15). The actual usage varies from system to system and there are sets of two protocol standards. For your own use, you don't have to follow any set protocol AS LONG AS BOTH MACHINES ARE USING THE SAME ONE. Figure 4 gives a list of ASCII code 0-31 and their meanings.

Note the two marked XON and XOFF. These you may recognize. XON/XOFF protocol is useful where large amounts of continuous data are being transferred. The receiving machine can send an XOFF code when it wants the transmitting machine to hold off sending data, and send an

ROM when it wants to transmit. This type of control is often used with dumb terminals to maintain flow.

Another method of transferring data is to send it in blocks of 3-255 characters (usually 128 chars). This removes the need for ROM/ROMF control because in each block it sends the two machines exchange control codes. This method of transfer also allows error checking to be carried out on the data. One of the most popular error check methods is the Cyclic Redundancy Check (CRC). We won't go into this here as there is no real need for such a complex check with hardware RS232. CRC is really useful for Telecommunications via modems. Phone lines are noisy and data errors may easily result at high baud rates. The CRC error check allows the two machines at either end to check the data for errors. If an error is found the receiving machine requests that the data is transmitted again.

When sending data using the block method the software collects data bytes into "packets" of 128 bytes. Assuming the link is open the transmitting machine (TM) sends a start-of-transmission code. The receiving machine (RM) replies with an acknowledge code. The TM then sends a start-of-block code followed by a data packet followed by an end-of-block code. The RM replies with an acknowledge code (assuming the data was received correctly) and the TM sends the next block. This continues until all data has been exchanged, whereupon the TM sends end-of-transmission code and the link enters a wait-41000.

The above description does not conform to any standard but will work. If error checks are included the RM could send a data-error code if the data had been corrupted whereupon the TM would retransmit the same data packet.

The program given in Figure 10 should run on any of the CBM machines discussed and is written in Basic. Since the romans are being controlled by the software, the receive buffer will not overflow. It allows a user to transfer a data file from one machine to another. The link is 1200 baud, eight data bits and no parity. It

0000 LDA #000	, Logical channel 1
0002 LDH #002	, Device 1
0004 LDH #000	
0006 JSR HFFBA	, Set file
0008 LDA #000	, Name length (3 chars)
000A LDH #NAME	, NAME is address of char string
000C LDY #NAME	
000E JSR HFFBD	, Setname
0010 JSR HFFCO	, Open
0012 LDH #002	, Make RS232 the input device
0014 JSR HFFC4	
0016 JSR HFFD4	, Get a character
0018 TAY, Save it	
001A JSR HFFC4	, Restore default device
001C TYA	
001E BFC #004	, If char =0 then no char rec
0020 LDA #XTABLE	, Get PCHSCH char from XTABLE
0022 JSR HFFD0	, Send to screen
0024 JSR HFFD4	, Check keyboard
0026 BEQ #013	, No char, loop to check RS232
0028 TAY	, Index
002A LDA #XTABLE	, Get ASCII equivalent
002C PHA	, Save
002E LDH #002	, Make RS232 the default output
0030 JSR HFFC4	
0032 PHA	
0034 JSR HFFD0	, Output character
0036 JSR HFFC4	, Restore terminal output
0038 BEC	, Forced loop
003A BCS #003	

Table 5

should be run on both machines. The control codes are shown in Table 6.

Note that I'm not using some of these as they should be used but, as I said earlier, as long as you stick to the same protocol on both machines you'll be OK.

Possible Developments

The example programs I've given here do not show all of what may be achieved using the RS232 interface. It

is possible (using a special version of the circuit described earlier) to have more than two machines running on a single 4-line RS232 connection. This would allow a group of users (with special software written in machine code for maximum speed) to set up a mini-network. The possibilities are endless. I hope this article has helped to fuel your imagination. If you have any comments or ideas, please write to me c/o *Test Commanders* or letter to CCH/RRR on Computer (4) SCI.

Table 6

Code	ASCII	Meaning in this program
5	ENQ	Answer/Inquire
6	ACK	Acknowledge
1	SOH	Start transfer (transfer stream)
4	EOF	End transfer
2	STX	Start block
3	ETX	End block
26	SUB	Enter terminal mode (special seq.)
30	DLR	Exit terminal mode (data link escape)

Age Group	Total (%)	Male (%)	Female (%)	Male (%)	Female (%)
18-24	~85	~80	~80	~80	~80
25-34	~75	~70	~70	~70	~70
35-44	~65	~60	~60	~60	~60
45-54	~55	~50	~50	~50	~50
55-64	~45	~40	~40	~40	~40
65+	~35	~30	~30	~30	~30

Factor	Level	Item	Mean	SD	Item info
1	1	Factor 1	47	10	Factor 1
2	2	Factor 2	47	10	Factor 2
3	3	Factor 3	47	10	Factor 3
4	4	Factor 4	47	10	Factor 4
5	5	Factor 5	47	10	Factor 5
6	6	Factor 6	47	10	Factor 6
7	7	Factor 7	47	10	Factor 7
8	8	Factor 8	47	10	Factor 8
9	9	Factor 9	47	10	Factor 9
10	10	Factor 10	47	10	Factor 10
11	11	Factor 11	47	10	Factor 11
12	12	Factor 12	47	10	Factor 12
13	13	Factor 13	47	10	Factor 13
14	14	Factor 14	47	10	Factor 14
15	15	Factor 15	47	10	Factor 15

Figure 1: A schematic diagram of the experimental setup. It shows a participant sitting at a table, looking at a screen. The screen displays a target (a small circle) and a starting point (a larger circle). A hand is shown moving from the starting point towards the target. The diagram is labeled 'Figure 1' and includes a caption below it.

[illegible]

1

Talking through your RS232

There's more to this interface than meets the eye. Do not be deceived by first impressions.

By Eric Doyle

An RS232 interface is hardly the most exciting product as far as appearance is concerned. For your money all you appear to get is two connectors with a length of cable to separate them. Don't be deceived by appearances, this could be one of the most satisfying additions for your Commodore.

An RS232 is the Commodore's link with the real world via the easy port, the most grounded socket on the back of any home Commodore machine. Via this socket you can communicate with Computers, link up with another C64, access a wider range of printers or perform electronic wordy with a whole series of domestic equipment.

I can already hear the moaning about the user port being RS232 and

you're not wrong but the great drawback is that the Commodore implementation only provides a 6k/5V output and most true RS232 equipment requires a +/-12V supply. York Electronic Research's interface does the necessary conversion for you.

Value for Money?

For your money you also get a disk on tape which contains the port for use and will also convert the 64 into a terminal emulator for use with a suitable modem.

It is obvious by reading the manual that the modem link and printer interface are considered to be the most important uses for the user and the detail is sufficient to get you up and

running. As far as connecting two 64s together, the detail is sketchy and a few wiring diagrams would avoid the possibility of the knee amateur blowing up two 64s in one fell swoop!

RS232 communications have a language all their own. Handshakes, baud rates, parity and duplex form the new vocabulary which not only confuses the newcomer but also has an oil-pumping effect on those considering modem communications. The new system is explained quite well in a concise way which proves that the jargon is no more than part of the rites of telecommunication.

Handshaking is a way in which one terminal tells the other that it is about to send data and the other terminal says it is ready to receive. Baud rate is

the speed at which information is transmitted. Quite often the speed of transmission can be different to the speed at which information is received. In human terms this means that one machine speaks more slowly than the other.

Parity is a check for data corruption. Anyone who has used a telephone knows how a bad line means that conversation can be difficult. This is also true in the computer world. Parity does not solve the problem but it can let you know that something is wrong. Information is sent in binary form, a string of ones and zeros in bytes of eight digits. If you're working on even parity, seven of the bits hold the information for a single character, the computer counts the number of ones in that character and if this is an odd number the eighth bit will be a one if not a well transmit a zero. The receiving terminal knows that if there is an odd number of ones in the transmitted bit, something has gone wrong. Similarly, with odd parity the

parity, based on odd numbers.

Full duplex is when both machines are able to talk simultaneously to one another and half duplex means transmission in one direction must end before the machine can receive.

The Relevant Software

The software for YER's RS232 interface supports any of three systems and a simple menu selection system. The Set Up program is usually run with RS232 printers and you only real concern is the baud rate. If the printer does not tell you which rate to use it will not damage the machine to experiment a little. The worst that can happen is that the printer will fail to respond.

A handy troubleshooting section should solve most of the problems with printers, but if a baud rate over 2400baud is required the 64 cannot respond fast enough. Luckily most printers have switches to select various rates so all may not be lost.

Limitations

The one drawback of the Terminal Emulator is that it can't handle Windows/Window style graphics which leaves your entry into the games world slightly. Apart from this, the software seems as thorough enough for any system you'd want to talk to and can cover the sophistication and cost of the modern world.

York Electronic Research have provided a service which is most commendable, given never realised they required. RS232 interfacing is the subject of several books and articles which benefit a writer of more who wish to combine an interest in a national electronics with a keen computer hobby. For these people YER can supply the missing link.

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286 EMULATOR CROSS-ASSEMBLER 64 only **disk £12.95**

A virtual integrated 286 development package. The emulator configures 286 machine code into optimised 68020 which runs on the 64 at approximately one sixth the speed of a 286. 286 is supports all but 20 of the 8086 286 operations, calls to BIOS routines and interrupts. The cross assembler generates hex or binary 286 object files. The disk also contains a powerful editor and several example programs.

64-DIRECTIONAL RS232 INTERFACE WITH COMMUNICATIONS SOFTWARE: 64 4" **tape/disk** £29.95

The 64-DIRNAIL supports RS232C via a three port. The DIRNAIL provides the necessary voltage conversion for direct connection to RS232C printers, modems and other devices. It is compatible with Bartender and Superboard. The unit is supplied with 1 metered cable (and 750pF capacitance) terminated in 25-way male pin female's D-subminiature. The software includes a terminal emulator which supports applications and also the file transfer utilities, a menu driven port configuration program and a transparent printer driver which reports the DIRNAIL to external device 4 printer output to the RS232C port.

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RS232 On The Plus/4

19,200 baud on the Plus/4? A Beeb listing in a Commodore mag? Are we kidding you? We certainly aren't...

By R C Hemes

Surprising though it may seem, the Plus/4 is a bit faster at communicating using RS232 than the 64. This is due to the 64 using a software simulator to copy the action of the 6551 ACIA IC which would normally be used for RS232. Indeed, the 64 is so slow that it often misses characters even at the slower 9600 baud.

The Plus/4 on the other hand, has a 6551 which handles all the RS232 signals except CTS which is dealt with by a 6529. Also, there is no need to connect 5-volts per pin B (as suggested in "Interfacing with the RS232" *Home Commodore* January 1987, p 45-46).

The Plus/4 software has facilities to use XON/XOFF flow control with the user's choice of XON/XOFF characters. Thus, as normally C, HL/5 for XON and CT/L/4 for XOFF. This facility is used to stop the remote device from transmitting more data when the receiving device has no more room in its input buffer, and to restart the remote device when the receiving device has roomed enough characters from its buffer.

The Plus/4 has a dedicated 6551 to RS232 user receive buffer located at \$0117 to \$0146 and a microprocessor transmit buffer at \$00C1 which is used to hold the current XON/XOFF character.

If the ACIA is configured the interrupt handler will call two subroutines to handle RS232 messages. The first routine checks for a remote device unsent XON/XOFF sequence and handles it

appropriately. Checks to see if receive buffer is full, and if so then receives the received character and returns. If there is room for eight characters then it sets status flags, and stores

XOFF character from \$7FD into the system transmit buffer and sets the received character in the user input buffer.

The second routine called will check ACIA transmit buffer empty

```

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and return if not.

Check for CTS signal low, and return if so.

Check input buffer full flag, and send what XOFF or XON is appropriate.

It is the job of the RS232 portman the CHIRP (instead of raw) the over buffer-full and remote-paired flags and remote sending of the XON character.

Note that the XON/XOFF protocol is used only if the user has FORKed the XON/XOFF characters into IFC and IFD respectively; if these two locations are zero then characters received when the buffer is full are ignored.

And The Proof...

I have tested the Plus/4 connected to a BBC Model B, running at 19,200 baud, with the BBC sending the Plus/4 at full speed, and over a one hour period not a single character was lost by the Plus/4. The two programs for the Plus/4 and the BBC are shown in Listing 1 and 2.

Unfortunately, there is a bug in the Plus/4 ROM (R33) routines, which causes the Plus/4 to crash immediately after it has transmitted the first XON stream character, and the rest of this article describes how to fix this bug.

First we need to make our own

copy of the Kernel ROM, and then patch the necessary code. This is not as easy.

Listing 1 is a listing of a Basic Program and a machine code program which copies the ROM down into RAM, erases the new version of the Kernel to be executed, and whilst switching back to ROM. The top of memory positions are also reset to \$FFFF, and the bad code in the RAM copy is fixed. The Basic program must be typed in exactly as shown, with no additional spaces, etc. as the machine code program is immediately above it at \$0001.

A disassembly of the R332 code in the Kernel is included in figure 3.

```

1  P00001,0:PO0005,0:PO0005,0:PO0002,128:PO0004,128:PO0005,128:CLM
2  $004163
3  NEW

```

Listing 1a: Basic program to copy top of memory pointers and call machine code program to copy the kernel and Basic from ROM to RAM and change all references to \$FFFF to \$FFF

Listing 1b: Machine code program to copy ROM to RAM and whilst switching to ROM

		ORG	\$1040
1043	78	SEI	
1044	88 58 FF	STA	\$FFFF JSWITCH TO RAM
1047	40 00	LDR	\$1000
1049	89 00 80	LDA	\$8000,7 COPY PART 1 OF ROM TO RAM
104C	99 00 80	STA	\$8000,7 JERASE TO \$FFFF
104F	C8	INT	
1050	40 FF	AND	LP1
1052	80 40 10	INC	LP1+2
1055	80 40 10	INC	LP1+5
1058	A0 40 10	LDR	LP1+8
105B	C9 FD	CMR	\$47D
105B	80 84	AND	LP1
105F	A0 40	LDR	\$840
1061	89 00 FF	LDA	\$FFFF,7 COPY PART 2 OF ROM TO RAM
1064	99 00 FF	STA	\$FFFF,7 J\$FFFF TO \$FFFF
1067	C8	INT	
1068	80 FF	AND	LP2

100A A7 3F	STA	200F0F	TRANSFER ALL NON-BLOCKING
100C 80 82 84	STA	201002	
100E 80 86 84	STA	201400	
1012 80 8C 84	STA	201800	
1018 80 8F 84	STA	201B07	
101E 80 C7 84	STA	201C02	
1020 80 C9 84	STA	201C09	
102E 80 08 04	STA	201A00	
1030 80 85 84	STA	201B03	
1034 80 81 8F	STA	202007	
2000 80 5F 80	STA	200102	
2004 80 40 8F	STA	200140	
2008 80 88 CF	STA	200B00	
200C 80 F7 8F	STA	200F07	
200E 80 5F 84	STA	200F09	TRANSFER TO RAM
200A A7 4C	STA	204C	RESET JMP SECS AT 200F09
2004 80 18 84	STA	200B00	
1000 A7 C5	STA	200000	
1004 80 8C 80	STA	2001000	
1008 A7 C0	STA	2000000	
100C 80 78 80	STA	2001000	
100E 82 06	STA	2004	RESET CODE TO PATCH AREA
100F 80 8F 80	STA	200A00	
1004 78 C5 C0	STA	2000000	
1008 C4	STA		
100C 18 FF	STA	LP3	
1000 58	STA		
1004 40	STA		
200C 80 CF 8F	STA	200CF	LEAVE ON IN SYSTEM O/P BUFFER
200E 48	STA		IFULL NEXT SECS INPUT DATA
200A 4C 18 80	JMP	200100	RETURN TO RESET ROUTINE

TRANSPORT AND CONSTRUCTION, BEFORE AND AFTER ROUTING AT SCHOOL

[illegible][illegible]

```

E0A7 00 04 0F      STA 00704      J STATUS 000
E0A8 40 50 00      LRA 00000      JSET ACIA 000 REGISTER
E0A9 10 70        000 00002      J -> NO DATA OR NULL
E0AB 00 05 0F      STA 00705      JZERO THE COUNT
E0AC 00 00        000 000      J01 IT 000 (PARABOLIC)
E0AD 00 0F        000 0000F      J -> 00

```

RECEIVED 000 0000F (000 WANTS US TO RESTART TRANSMISSION)

```

E0AE 40 10        000 00000      FFE0, 01000
E0AF 00 00 0F      STA 00704      F LOCAL PAPER FLAG
E0B0 10 50        000 00000      J 000 RETURN
E0B1 00 70 0000F  000 000      J01 IT 000 CHARACTER?
E0B2 00 0F        000 00002      J -> 00

```

RECEIVED 0000 CHARACTER, BEFORE 000 WANTS US TO STOP TRANSMISSION

```

E0B3 40 1F        000 0000F      FFE0, 001 LOCAL
E0B4 00 00 0F      STA 00704      J PAPER FLAG
E0B5 00 70        000 0000F      J 000 RETURN
E0B6 40 00 0F 00002  000 00705      INCRASE IN 000 INPUT BUFFER
E0B7 00 10        000 00000      FFE0?
E0B8 70 2F        000 00000      J -> 000
E0B9 00 10        000 00100      000, 01 THRESHOLD FOR 000?
E0BA 00 0F        000 00000      J -> 00
E0BB 40 70        000 000      FFE0, 000 0000 COUNT
E0BC 10 00        000 00000      J -> NO 0000 COUNT RETURN
E0BD 00 00 0F      STA 0070F      FFE0 IN 00000 000 BUFFER
E0BE 40 7F        000 0000F      FFE0
E0BF 00 00 0F      STA 00700      FFE0 00000 BUFFER FULL FLAG
E0C0 00 07 0F      STA 00707      J01 00000 PAPER FLAG
E0C1 40 00 0F 00000  000 00700      J01 000 000 BUFFER (0000)
E0C2 00          000
E0C3 00          000
E0C4 1F 1F        000 0000F      J000 00000 000 00 00 AND

```


DATA 06 05 07	STA 00704	1 0000 NEW INDEX
DATA 06	END	POST INDEX IN 06
DATA 06 05 07	LDA 00705	POST INDEXED CHAN
DATA 06 07 05	STA 00707,4	1 AND STORE IN NEW I/P REP
DATA 06 05 07	LAC 00705	INCRAS IN CH 0/P 0/P REP
DATA 06	BRND	005

CONTINUATION OF DATA FOR 0050 MESSAGE

DATA 06 05 07 0001	LDA 00705	INCRAS IN CH 0/P 0/P REP
DATA 06 04	END 00704	1 -> 0001
DATA 06	REP	SAVE CURRENT STATUS
DATA 06	001	
DATA 06 07 07	LDA 00707	0/P 0 PATCH INDEX
DATA 06	END	END CHN
DATA 06	TRN	
DATA 06 07	END 00706	INCRAS NEW 04
DATA 06 02 07	STA 00707	1 AND INCRAS 07
DATA 06	REP	INCRAS INCRAS 07
DATA 06	END	0/P 0 PATCH INDEX
DATA 06 07 01	LDA 00707,4	POST INDEX CHAN FROM I/P REP
DATA 06	REP	1 END STATE
DATA 06 05 07	LAC 00705	INCRAS INCRAS IN REP
DATA 06 05 07	LDA 00705	POST INDEX IN I/P REP
DATA 06 06	REP 0006	
DATA 06 06	END 00706	1 -> INCRAS 0/P 0
DATA 06 07 07	BIT 00707	0/P 0000000000000000
DATA 06 04	REP 00000	1 -> 00
DATA 06 05 06	LDA 00706	0/P 0000000000000000
DATA 06 05 06	END 00706	1 -> 00
DATA 06 07 07	STA 00707	INCRAS 0/P 00 00 0000000000000000

HERE IS THE END. THE NEXT CHARACTER TO BE REFERRED TO THE USER
IS THE REP ENTRY ON THE STACK. A PLA SHOULD BE DONE HERE.

```

0010 00          SEC
0011 00 00 00 00 000 00700  CROSET SYS BUFFER FULL FLAG
0012 00 00 00 00 000 00707  I AMB 000000 PAUSE FLAG
0013 00 00 00 00 000 00708  PACE1 PRESBIT*
0014 00 00          SPL 00000  I -O- 00
0015 00          00024  P00  JTED, DATA NEXT CHAR TO SEND
0016 00 00 00 00 000 00708  L00 00000  SEND DATA STALLS MSG
0017 00 00 00          AMB 000000000  I HAVE MSG
0018 00 00 00          000 000000000  I AMB 000000 00
0019 00 00 00          000 000  I STAGE IN CHANNEL 00 0000
001A 00          P00  J0000000 (CHAR SENT
001B 00          000 000  FLAG NO ERROR
001C 00          000

```

00100 0000 CHARACTER TO TRANSMIT

```

0017 00 00 00 00 000 00708  MIT 00708  J0000 0000 BUFFER FULL*
0018 00 00          000 00007  J0000, WAIT FOR IF NO LIMIT
0019 00 00 00 00          STA 00708  J00, STAGE 0000 000 000 0000000
001A 00          SEC  I IN 0000 0000 0000, SEC
001B 00 00 00 00          000 00708  I 0000 0000 BUFFER FULL FLAG
001C 00 00 00          JMP 00024

```

INITIALIZE 00000 CONSTANTS AND ACB

```

0010 00 00          00000  L00 0000  CLEAR ALL
0011 00 00          L00 0000  I 00000
0012 00 00 00 00 000 00704  STA 00708,0  I 00000000
0013 00          000
0014 00 00 00          SPL 00000
0015 00 00 00 00          STA 00708  J00000 ACB
0016 00 00 00          STA 000  J0000 000 CHARACTER
0017 00 00 00          STA 000  J0000 0000 CHARACTER
0018 00          000

```

Past and Present

Commodore's history is a fascinating story of depression and elation. Where did it come from and where is CBM now?

by Norman Doyle

The story of Commodore's rise is a typical American tale, to reflect fate, a story which is inextricably linked with the fortunes of Jack Tramiel, the company's founder. Commodore came late to the development of the company, starting with the PET series and currently scaling the heights with the new Amiga range.

During the War, Tramiel lived in Nazi-occupied Poland where he was subjected to the suffering associated with being a Jew under Hitler's reign of terror. When liberation came it meant a new life for Tramiel in his adopted country, the USA.

At first a time, as a lone of war, Tramiel joined the US Army where he was in charge of Army office equipment maintenance in New York. Hardly a glamorous occupation but one, which was to set him on his way to a fortune, back on earth, again.

Typewriter maintenance became his career and soon he was able to form his own company in Elmhurst. This was built in 1948 and the Commodore Typewriter Company's first product was the Elmhurst typewriter. The shape of things to come, started to form in 1950 when Japanese made mechanical adding machines were added to the range. This line expanded through the 1950s encompassing all forms of office furniture and equipment. The rapid growth was followed by an equally rapid decline and in 1964 it would have seemed a complete, but for the intervention of an enterprising Tramiel.

When Irving Gould stopped in with for much needed cash, he started a new phase of growth for Commodore which saw the introduction of electronic pocket calculators in 1969. The CTR calculator sold for just under \$200, a phenomenal price by today's standards but a relative cheapie in the early 1970s.

The middle of the decade saw Commodore in trouble once more. Suddenly chip prices fell from \$10 to \$1 and the calculator price war began. Commodore to avoid itself ending up in a pile of discarded chips and eventual bankruptcy once more, varied Tramiel in the lap. The problem was exacerbated when the chip supply dried up after Texas Instruments decided to work a little more on their own calculator products. Tramiel is known for not doing anything by halves and his solution was to buy out seven companies, which produced the raw materials and components for his new range of machines.

Tramiel's decision brought 22 lawsuits from companies which he had contracted to supply his needs. Miraculously none of these suits was successful and CBM was on its way to the top.

Formerly one of Commodore's suggestions in 1976 was MOS Technology, which was developing a new microchip called the MOS 6502. Another well known man in the person of Chuck Peddie, whose vision of computers for the home played the seed for Commodore's future development.

There followed a short flirtation with the hobbyist market with the production of the KIM, a single board kit, based around the 6502. Shortly after this the first PET appeared. Originally destined for a rather poor company which was breaking into the electronics market, the PET was turned down by Tramiel's on favour of another machine, which became the TR-800 computer.

Tramiel decided to take on the PET, even though he, now considered Commodore's prime business to be component manufacture. At the time his main aim seemed to be managing a potential fire from the development of the machine. Any quality which he may have had were dispelled after the 1977 Consumer Electronics Show in Chicago when the Pet attracted 13 million worth of orders within two months. Commodore had had entered the big league.

The first PET was an inlegant beast with built in 40 column screen, cassette recorder and a tape RK memory. Though passing by modern standards this was however its first and more and more American families decided it was a really neat addition to their home furniture.

1978 saw sales started and Commodore was well on its way, and more as a computer company rather than a pure component manufacturer. In 1979 Japanese disk drives and printers were added to the Commodore range and 1980 saw the appearance of the 1600 and 2600 series machines.

Also in 1980 the first of Commodore's mega selling computers hit the streets. The VIC 20 was cheap and colourful and captured the imagination of the home market. Its eight colours and 22 columns by 24 lines, with a display with 1 K of RAM was most surprising in this country by the Sinclair Spectrum but not before the VIC had established Commodore as a major force in the home computer market.

Since then Commodore has had a chequered history. The continuing popularity of the VIC's successor, the Commodore 64, has been countered by a range of less successful machines. Tramiel's company shares depletion, from Commodore, leading to his taking over a real company Atari has added to Commodore's worries. Furthermore, Government and European firms to finance the setting up of a factory at Corby being counteracted by market forces which caused the works to be closed down only a few years after it opened.

Commodore, now seem to be back on the road to total recovery and a lot of their future hopes are pinned on the Amiga, a project inaugurated during Tramiel's reign and now being shadowed by Atari's ST machines. Will Jack Tramiel be able to do with Commodore's destiny?

Red Boxes

Now there's a home control system available for the C64, which will switch on the kettle and the telly or even warn of intruders.

By Microsoft Appleby

Home control has always been promoted as one of the major uses of computers in the coming years. However, in the past home control systems were expensive, difficult to use, and were only available on micros with good complex interfacing systems like the BBC Micro. Most common computers like the Commodore 64 were normally used as all time unattended slave port that doubled as an RS232 and an obscure custom serial system, not really the stuff that interfacing dreams are made of.

Finally, there is now on the market an easy to use home control system that is available across a range of micros including the Commodore 64. The starter pack for *Red Boxes* comprises the main controller — called 'Red Leader' and two control units — an infra-red detector (red user) and a plug interface (red user). The concept behind the *Red Boxes* is the controller unit 'talking' to all the other units via a modified serial link via the main.

Red Leader is a computer in itself. Comprising a 5502 derivative processor just like the C64, 8K of RAM and a BBC-like control Basic. The Commodore 64 concept to this and is used as a terminal. The way this is done is extremely clever. A wire is connected on the C64 'Panic/Run/Stop' and the Red Leader behaves just like a cassette player, sending cassette-type signals to the Commodore 64.

After a short time the terminal program is loaded into the computer and the link between the Red Leader and the Commodore 64 turns into a

proper two-way serial link. You will then drop into the control program mode.

This mode is the simplest operating method on the *Red Boxes* system (the other being Red Basic, but more of that later). You are presented with a menu where you can log-on devices (or tell Red Leader that they exist), type in their code addresses, turn them on or off and set them up to turn on or off at specific times. You can even relate the input of one to the output of another so that a movement on the infra-red detector will activate an alarm for instance.

This program, whilst being currently simple is also quite powerful and lets you perform all the major actions that you would want to in a quick and easy manner. However for complex, multi-line, interaction you need to get down to compilation and programming. For this you need to use Red Basic and probably need to get hold of the *Programs Manual* (good value at £9).

Documentation

The manual supplied gives you some simple information on the Basic, but is really aimed at the inexperienced user to give you more detail about the main program. The *Program Manual* on the other hand, is one of the better ones that I have read. Going into enough detail for the experienced programmer but to do something really flashy for the beginner who may feel with Commodore Basic and wants to get down to using Red Basic.

If you have ever used a BBC Micro

you will be immediately used to Red Basic as Red Basic is a subset of BBC Basic, with a lot of extra commands added to handle the control aspect of the system. If you think that Red Basic being the same as BBC Basic is a little strange then you won't when you hear about the Founder of General Information Systems (the people who make Red Boxes), Chris Curry (for it is he) started Acorn many years ago and the name of the first projects that he has embarked on since the Acorn share up.

As well as most of the BBC Basic commands and instructions — which includes most of the structured programming aids (repeat, go, etc) there are commands to log-on devices and manipulate them. As this Basic is a lot more advanced than the Commodore 64 Basic, you should have no trouble at all in telling it to do whatever you want, especially with the multi-line commands. These are commands that are very similar to some commands on the Amstrad. Sections of programs are executed when an external device instructs them. So if the timer section of your program is controlling the heating and a heater trips the infra-red motion detector then the 'alarm' section of your program can be activated.

It may not sound like a lot, but try and think of the last time that you wrote a program that was actually OK in length. Remember you don't have to worry about syntax or syntax memory or syntax or syntax. The Commodore 64 handles all of that. And if Basic is a bit tight you can

always switch to machine code.

The Red Leader uses a 6802 processor and you can program it in machine code by pointing code into memory and then executing it. The Projects manual carries a list of operating system functions which are very similar to a lot of ways to the Commodore Kernal system. The Basic has the same memory management as the original BBC Basic with pseudo-variables like Page and Top to indicate where the Basic program is going to sit and Lowmem and Hmem to reserve space for the machine code area. The operating system and memory areas are also very similar to the BBC, even down to where the system memory ends.

The Basic can also save any programs written under it to a tape connected to the Commodore 64. To do this, the Red Leader first transfers the contents of its memory to the C64. You must then disconnect Red Leader and connect up a tape recorder and write to tape. Then re-connect everything up.

The main plug of this system is that when you have a program debugged and working to your satisfaction you can unplug the Commodore 64 from Red Leader completely and use it for something else or whatever. Yet Red Leader will just sit there executing your program forever. However, you can leave your Commodore 64 connected if you want to — if you need to see information displayed on the screen for instance — though the power consumption over a period of time would be outrageous. The Red Leader on its own uses up very little power, and it is feasible to leave it switched on all the time.

Reds One and Two

The two units supplied with the starter pack are Red One and Red Two (natch a bit like something out of *Apocalypse Now*). Red One is the activator. This is a unit that plugs into the main 24-pin cord and then has a main socket at the other. Anything you like can be connected to this and turned on and off from Red Leader. There is also a manual override on the unit to toggle it on and off in you can



do. An LED on the box tells you whether it is on or off.

Red Two is an infra red motion detector. One end plugs into the mains (as usual) and at the other end is a small box about half the size of Red One and Red Leader. In this is a large window. If anything that is at a different temperature than the surrounding air moves within 16 feet of it then a signal is sent back to Red Leader.

All three units come with well mounting brackets with all screws and fixings, though they don't need to be well mounted, it is excellent that there are included. The cables are also very long, over six feet in most cases. This is just about the right length. Usually on systems such as these the cables are not quite long enough. I think that they got it right this time.

In the near future CDS will be releasing an alarm unit and an analog input unit. These will allow you to build up an alarm system more easily or control a thermostat for heating. Next in line are temperature probes and an RS232 link.

This last unit will allow your computer to talk to a printer in another room or even another building, by sending its information down the mains line. This will also be used in networking computers in a

simple and easy manner.

If anyone is worrying about the mains system, don't. It is perfectly safe and very well worked out. Each unit has its own unique serial number and the Red Leader has to know what it is. So while you could control your next door neighbour's heating system you'd have to know his encryption code first. However, if you wanted to communicate with a friend down the road as long as you were on the same local ring main, and within a few hundred yards you could do it.

Verdict

On the whole this is a brilliant system. One of my main interests in computers is in the field of irrelevant control. And this is the nearest to use valves, and most well thought out system that I have ever seen. The only obstacle in its path are public resistance to this sort of thing and the price which though low for a control system, is still high for the average Commodore owner. I will watch this with interest.

Footnote

Company: General Information Systems, 1 White Hall Road London SE1 1NX. Price: £129 (starter pack).

Spanner in the Works

If you rely heavily on your computer for business or leisure activities, then a breakdown can be infuriating. Here are a few tips on simple fault finding and repairs.

By Mike Roberts

The entire range of Commodore computers set high standards in design, production and reliability.

All the hardware is built up to a specification rather close to a peer within one or two of its competitors.

Opening up any Commodore computer will show a large number of integrated circuits which are the chips that make the computer work. However, they are usually the first to go, so produce problems where something serious malfunctions in your computer.

There can be other reasons for your machine's failure and many are serious. If your guarantee has expired, you may be faced with a hefty bill.

However, all is not lost: You can usually trace the cause of a breakdown to one or more of the IC's. Replace the chip, and the problem is solved.

Following a simple check list can save pounds when a contact to repair.

Your Options

Imagine a nightmare situation. You sit up your C64 plug everything in and

connect the screen (am I all on, and nothing? The screen is blank and the keyboard dead.

"What can you do?"

Firstly, you should check the LED on the top of the machine. If this is off then the power supply has probably blown. This is the only situation (excepting the unlikely event of the LED fusing) in which the LED will not light up. If the LED is lit, then you must test the computer.

Going Inside

First, connect a tape deck, insert a tape, on the front loader, and press the run/stop. If this tape is dead then so is the computer.

The next step is to check the internal of the machine. Remember that the LED panel is tapped from the supply before the fan. The computer takes no power after the fan. So this is the first thing that must be checked. If it has blown then you've located the problem, and you can fix it quite easily.

The first unit with a test point and is of the type BIL TAG one step

PSW. It is located on the right hand side next to the power socket close to the regulating and rectifying circuitry. If the fan is working then the only other explanation is that a section of this circuitry is blown. But this is rare, and you would usually see the damage in blackened fixed components. If this is the case then you need professional help.

Chip Testing

If the computer is just behaving oddly then you need to ascertain which chip is causing the trouble. A lack of screen display usually means that the video output circuitry has blown, as this involves a lot of discrete components. You will also need professional help for this. The chip can be tested by plugging it into a friend's C64 so see if the same problem reoccurs.

This technique of using another C64 to test chips is relatively safe, but be careful not to force chips or heat pins. Make sure you earth your hands by touching something metal before handling any components.

If your video circuitry is OK then

any other problem will generate a screen display from which you may be able to diagnose a fault.

Junk on the screen with a regular pattern and an underlying pattern of the correct display indicates a RAM problem. Professional service again is advised.

Absolutely sinister obviously indicates a dead sound chip. The sound circuitry is very robust, and it is usually the chip that is the first to go.

If the ROMs fail then you will be left with a blank screen. Although there is very unlikely to be one amongst the most reliable chips in the machine. A dead processor will also exhibit symptoms similar to this.

The remaining main chips are the I/O ROMs (age). There are two types of these. C1 handles the keyboards and joystick. Junk being typed out on the screen as soon as you turn it on, or a dead keyboard indicates either a fault with this chip or its support circuitry.

Altogether, older machines may have their keyboards full of dust. Cleaning will solve the problem.

The other chip, C2, handles most of the main I/O with the user port and serial I/O.

The problem here is that it is difficult to diagnose whether the fault lies with the chip or C2 or the device currently in use (eg. the disk drive).

Summing Up

If you follow these simple tips you may be able to root fix a small fault yourself, or at least have some idea of what has malfunctioned.

If the fault is more complex, you need to find a good repair shop. In this case, it is better to use a larger organisation rather than a one horse outfit, and preferably one that specialises in Commodore computers.

Repair Touchline

J. Katsman Tel: 0204 44454 (phone only)

ACE Services-Clon Spencer, 10 Albion Street, Mansfield, North NG18 6E Tel: 0424 14282

Pringo Electronics, Mr Probs, Unit 4, 15 Springfield, Macclesfield, Cheshire M43 2JH Tel: 0161 834 7140

Smiths, Mr Ian Kinnear, 146/17 Eastern Esplanade, Southend-on-Sea Essex, Tel: 0782 811774

GC, Bower and Sons, Mr Bower, 14 Birmyngham Road, Birmyngham, Birm., B1 1 7HQ Tel: 0424 616146

Coyden Computer Centre, Don Scrammell, 24 Birmyngham Road, Thornton Heath, Surrey CR4 3JL

PTS Electronics, Mr Pierce, 5-8 Portland Road, Exeter, Devon EX1 1JH Tel: 0352 416173

Macdonald, Mr Paul, The Old School, Main Street, Farnley, Featherston, PE7 1AB Tel: 0733 343733

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Postingsperiode	Rechnungsart	Umsatz
1.1.2018	Rechnung	1.000,00
2.1.2018	Rechnung	1.000,00
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Alabama	1990	3,000,000	52,400	57
Alaska	1990	550,000	663,300	0.8
Arizona	1990	2,500,000	113,900	22
Arkansas	1990	2,000,000	53,100	38
California	1990	29,000,000	163,700	177
Colorado	1990	3,000,000	104,000	29
Connecticut	1990	3,000,000	5,500	545
Delaware	1990	600,000	2,400	250
Florida	1990	15,000,000	57,900	260
Georgia	1990	6,000,000	59,700	100
Hawaii	1990	1,000,000	10,900	91
Idaho	1990	1,000,000	83,700	12
Illinois	1990	12,000,000	149,900	80
Indiana	1990	6,000,000	37,300	161
Iowa	1990	3,000,000	72,600	41
Kansas	1990	3,000,000	82,200	37
Kentucky	1990	4,000,000	40,300	99
Louisiana	1990	4,000,000	27,700	144
Maine	1990	1,000,000	9,300	108
Maryland	1990	5,000,000	10,400	481
Massachusetts	1990	6,000,000	8,000	750
Michigan	1990	10,000,000	96,800	103
Minnesota	1990	5,000,000	225,300	22
Mississippi	1990	3,000,000	47,800	63
Missouri	1990	5,000,000	69,700	72
Montana	1990	1,000,000	117,100	8
Nebraska	1990	2,000,000	77,300	26
Nevada	1990	1,500,000	110,600	14
New Hampshire	1990	1,000,000	9,300	108
New Jersey	1990	9,000,000	14,700	612
New Mexico	1990	2,000,000	121,500	17
New York	1990	19,000,000	54,500	349
North Carolina	1990	7,000,000	51,900	135
North Dakota	1990	1,000,000	70,600	14
Ohio	1990	11,000,000	44,800	245
Oklahoma	1990	3,000,000	69,600	43
Oregon	1990	3,000,000	98,300	31
Pennsylvania	1990	12,000,000	46,000	261
Rhode Island	1990	1,000,000	1,500	667
South Carolina	1990	4,000,000	32,000	125
South Dakota	1990	1,000,000	77,100	13
Tennessee	1990	5,000,000	42,300	118
Texas	1990	17,000,000	695,600	24
Utah	1990	2,000,000	84,900	24
Vermont	1990	500,000	9,600	52
Virginia	1990	6,000,000	40,800	147
Washington	1990	4,000,000	71,300	56
West Virginia	1990	1,500,000	62,700	24
Wisconsin	1990	5,000,000	65,400	76
Wyoming	1990	1,000,000	97,800	10

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1. **Introduction**
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 3. **Methodology**
 4. **Results**
 5. **Conclusion**
 6. **References**

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